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AUTOMOTIVE INDUSTRIES

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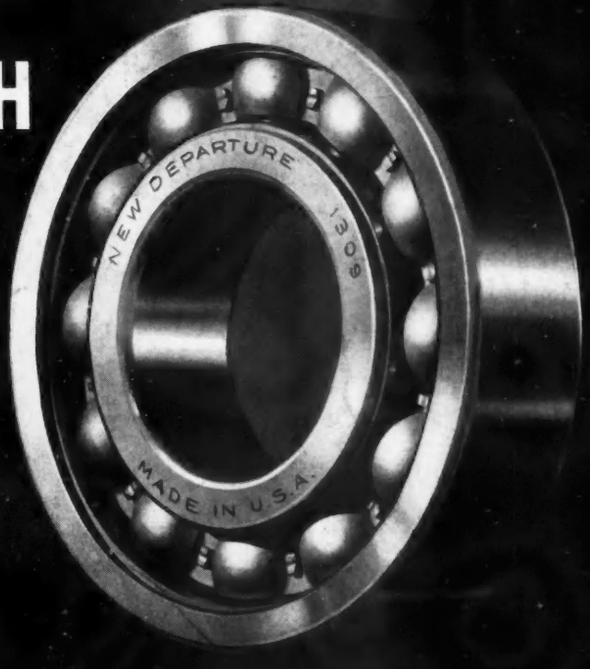
RESOURCES *for* RESEARCH



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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Reg. U. S. Pat. Off.
Published Semi-Monthly

Volume 83 Number 9

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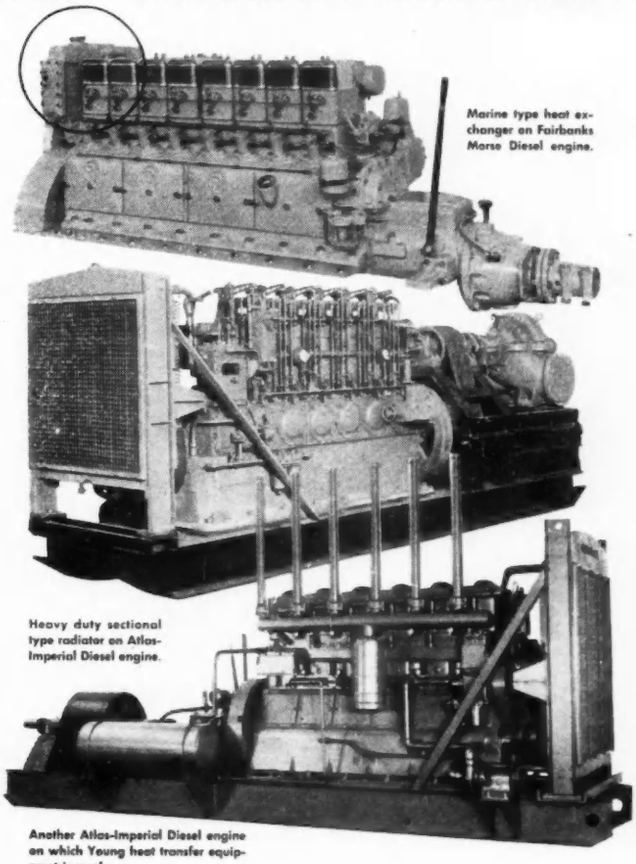

Marine type heat exchanger on Fairbanks Morse Diesel engine.

Heavy duty sectional type radiator on Atlas-Imperial Diesel engine.

Another Atlas-Imperial Diesel engine on which Young heat transfer equipment is used.

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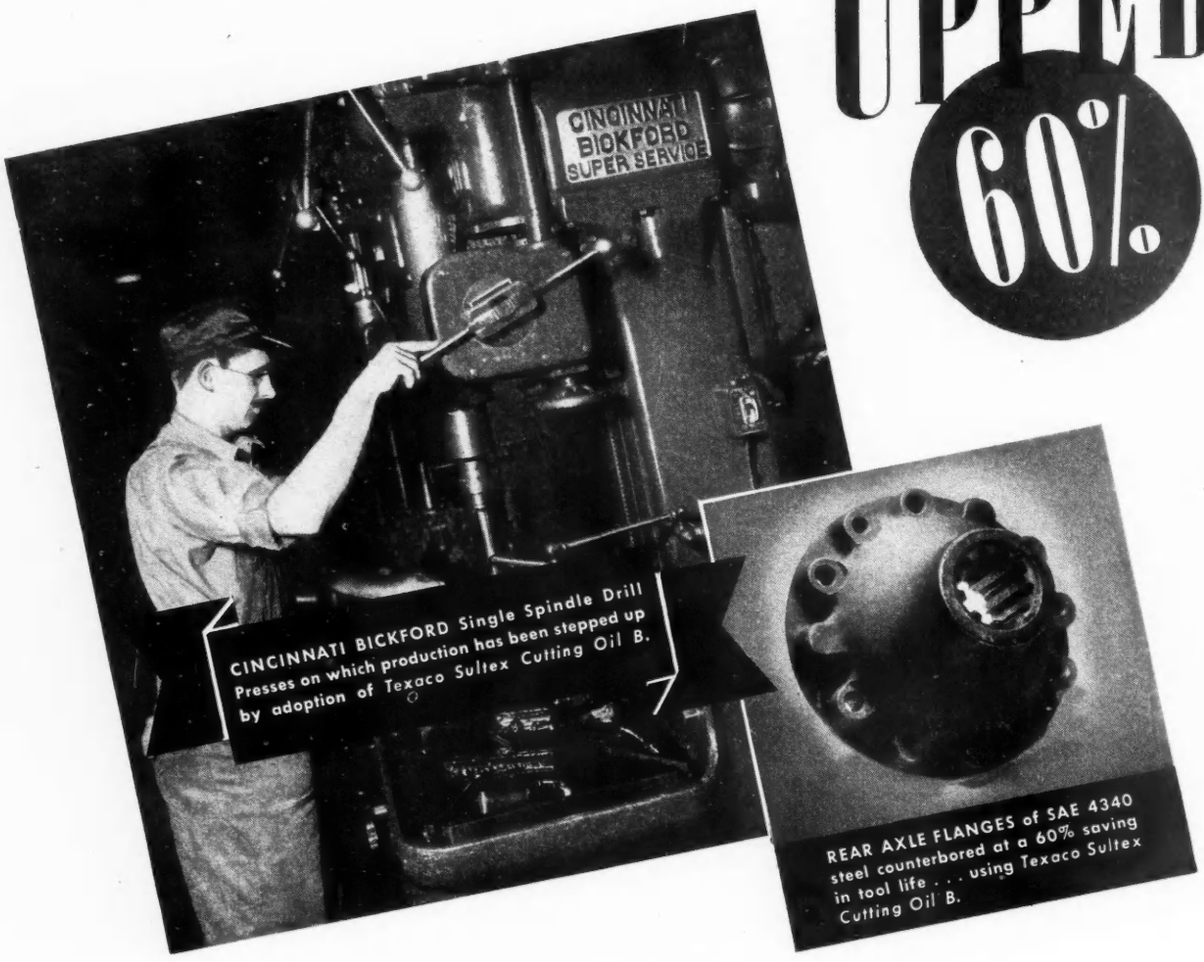
Counterbore Life UPPED 60%


CINCINNATI BICKFORD SUPER SERVICE
CINCINNATI BICKFORD Single Spindle Drill Presses on which production has been stepped up by adoption of Texaco Sultex Cutting Oil B.
REAR AXLE FLANGES of SAE 4340 steel counterbored at a 60% saving in tool life . . . using Texaco Sultex Cutting Oil B.

COUNTERBORING rear axle flanges on single-spindle drill presses, this well-known shop increased counterbore life 60% with fewer tool changes, and less tool-grinding expense.

The only change made to achieve these operating improvements was to use *Texaco Sultex Cutting Oil B.*

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TEXACO SULTEX CUTTING OILS SOLUBLE OILS

IN THIS ISSUE . . . .

AUTOMOTIVE INDUSTRIES

Reg. U. S. Pat. Off.

Volume 83 November 1, 1940 Number 9

ON FRIDAY, March 1, 1940, the twenty-second Annual Statistical Issue of AUTOMOTIVE INDUSTRIES was released and on Monday, March 4, 1940, work was started on the 1941 Statistical Issue. How could the issue be improved? What new and pertinent information could be added? Should our specifications questionnaires be changed once again in order to reflect the new advancements in design engineering that had been made? These and a multitude of other questions were considered, discussed and acted upon.

As design engineering was the most important feature of this annual reference book, it naturally received the most of our attention. Personal calls were made upon the leading manufacturers of the various types of vehicles and engines from Philadelphia to mid-Illinois, Wisconsin, Michigan, Ohio and Indiana. The specification tables were gone over with the proverbial fine-tooth comb. Suggested changes were received as to additions and deletions, though there was a unanimity of opinion that there was nothing that could be deleted without material loss in value to those manufacturers who are represented in this publication.

On returning to the office, days were spent in endeavoring to coordinate the suggestions received throughout the industry into clear and concise questionnaires, the material from which was to be published in the 1941 Statistical Issue. These preliminary questionnaires were then mailed out for approval to not only those companies called upon personally but also to all of those other manufacturers that lack of time prevented us from visiting. The return mails carried further suggestions but, finally, questionnaires were evolved which we believe reflect the majority opinions of those engineers who are working with passenger cars, buses, trucks, gasoline engines, Diesel engines, aircraft engines, outboard motors and tractors.

The mail is now carrying these questionnaires to you and there is no doubt that more than ever before, the big buyer, Uncle Sam, through his procurement divisions, will be looking at your answers with the most critical eyes, as will the automotive industry's regular big buyers, as usual. In these days of preparedness and national defense, specifications are of paramount importance. It is to your advantage as the manufacturer to see that complete details are furnished to the multitude of officials who will be scanning them to find out where they can secure just what they need whether it be an engine for a car, truck, bus, tractor, tank, airplane, motor boat, ditch digger, road builder or whatever it may be needed for.

The Annual Statistical Issue of AUTOMOTIVE INDUSTRIES is an earnest endeavor on our part to give the automotive industry all of the various details of that industry that can be presented in tabular form. It is the only publication of its kind in the entire world where in one place can be found pertinent, factual details regarding the motive power used to propel every type of commercial land, air and water vehicle used in this country and a considerable portion of the rest of the world.

It is a tremendous task we undertake every year to compile this multitude of details and we take great pride in improving their presentation to you. Won't you help us in this task by furnishing us with your specification details on the questionnaire forms that have either reached you already or will be with you within the next few days? The sooner they are returned to us the better job we can do for you.—MARCUS AINSWORTH.

DESIGN

Summary of Design Changes on 1941 Cars **473**

When the first fanfare of the National Automobile Show has died down, and when all the new cars are on the street, it's time to sit down and evaluate, in perspective, the improvements on new automobiles. P. M. Heldt, who's been looking 'em over since 1895, takes on the job.

MANUFACTURING

Ford Press Shop at Dearborn **476**

Here is the ultimate idealization of mechanized production. Ore is unloaded into conveyors. In 28 hours it's a Ford body in the white, on its way to the paint and trim shop. Scrap from the press operation goes down a chute and starts through the cycle again. Joseph Geschelin reports the miracle.

DESIGN

Design of Two-Stroke Cycle Engines **483**

Herewith we conclude the first full length consideration of two cycle design to be published in many years. The author is Scipione Theves, D.Sc., whose reappearance in AUTOMOTIVE INDUSTRIES after years of absence has been hailed by scores of readers.

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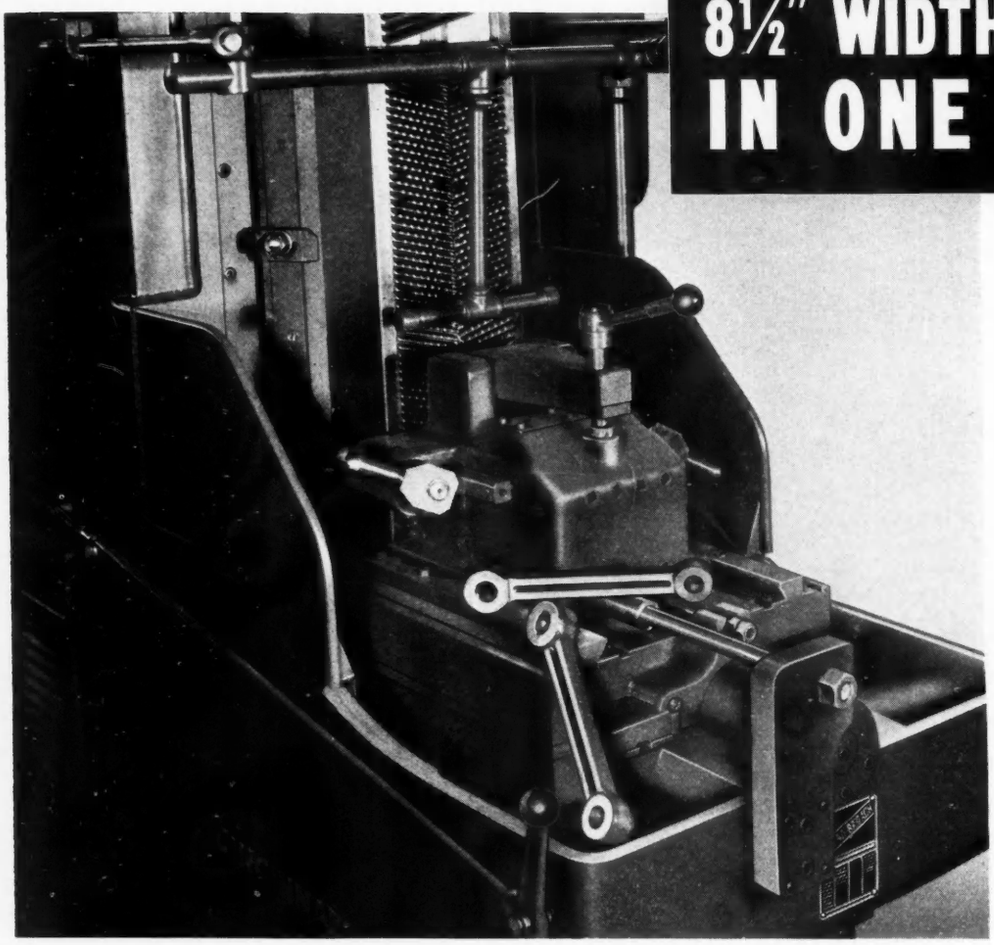
8½" WIDTH OF CUT IN ONE SLICE



CINCINNATI

YOU'VE probably walked through your shop and wondered why a weird nightmare of screaming and chattering originated from one of the machines. Chances are, it was taking a wide cut—too wide for the rigidity of the machine, cutters or fixtures. Unless these three elements are designed with sufficient rigidity, chattering will develop while production takes a nose dive.

An example of well-balanced design for wide cuts is illustrated above. The machine—a CINCINNATI No. 10-66 Single Ram Vertical Hydro-Broach—takes a cut 8½" in width in one stroke of the ram, removing 1/16 stock. Both edges of the parts, articulated rods for aircraft engines, are broached to a smooth finish and exactly central with the previously finished bosses—at a production rate of 41 rods per hour.

Perhaps you can step up production of those unusual jobs in your own shop with CINCINNATI Hydro-Broach Machines. Our engineers will gladly give you their recommendations. In the meantime, write for literature—M-886 for the Single Ram Machines, and M-894 for the Duplex (Double Ram) Machines.

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AUTOMOTIVE INDUSTRIES

Published on the 1st and 15th of the month

Vol. 83, No. 9
November 1, 1940

Summary of Design Changes on 1941 Automobiles

By P. M. HELDT

ALTHOUGH detail improvements are numerous in the passenger cars for 1941, really outstanding engineering advances are few in number. As usual in recent years, most attention again seems to have been given to appearance features. Practically all cars have radiator grilles of new design, new front-end styling, and new ornamentation both inside and out. Two-tone finishes are offered by a number of manufacturers, and the two-tone effect this year has been carried inside the car, where the upholstering is in two shades of the same color. Considerable play is made also of color effects in the interior fittings, particularly where these are of plastics.—After making a round of the exhibits at the New York Automobile Show one feels compelled to admit that the stylists have done an excellent job this year.

The tendency first noted some years ago, for manufacturers to increase the lines of cars which they offer to the public, but to limit as far as possible the number of basic parts, such as engines, transmissions, rear axles, etc., that go into these cars, receives further emphasis this year. Thus Cadillac, which last year equipped its six lines with three different engines, this year employs a single engine model for an equal number of lines, the Cadillac 16 and LaSalle engines having been dropped. Lincoln lines have been increased from two to three, but whereas last year each of the two lines had its own engine, this year all three carry the same engine. The object of this change in policy seems to be to bring to the higher-priced field some of the advantages of mass production and still offer the customer as wide a choice as possible.

It is noteworthy that a good many of the new cars are larger than the models which they supersede. Wheelbases have been increased, more particularly in the smaller cars, including the Chevrolet, Ford, Hudson, Mercury, Oldsmobile, Pontiac and Willys. True, there have been also a number of reductions in wheelbase, but most of these are limited to ½ or 1 in. and, therefore, are insignificant. In a few cases the over-all length of the cars has been increased while the wheelbase remains the same. There are numerous cases of increased body widths, which is due to the tendency to either eliminate running boards or to widen the bodies so their sides extend over the running boards and completely hide them when the doors are closed.

Thus the most popular cars are constantly getting bigger. This would seem to improve the chance for smaller cars in the lower price range, and three cars which have been launched during the past two years to compete with the original three in that field are somewhat smaller than the latter, on the bases of piston displacement, wheelbase, and weight. On the other hand, the Ford Motor Company has discontinued production of its low-powered model, the V8-60.

In the course of the year the number of chassis models or lines decreased from 51 to 48. Two of the models that disappeared were those that had the largest engines in the 1940 list, these being the Cadillac Sixteen and the old Lincoln, with piston displacements of 431 and 414 cu. in., respectively. The Lincoln is still being manufactured, but it is a rather different car, as it carries an engine of 292 instead of 414 cu. in. displacement, and the rear-axle ratio, wheelbase and tire equipment are different. One name—Graham—has disappeared from the list of American passenger-car manufacturers, not necessarily definitely.

There has been a further increase in standard compression ratios, the average this year figuring out to 6.60, as compared with 6.41 in 1940. Optional compression ratios are offered in connection with one-half of all of the models, and while these usually are higher than the standard ones, in the case of the Oldsmobile they are lower. In at least one case the compression ratio is admittedly too high for regular-grade gasoline, and the use of premium-grade fuel is recommended. The latter probably will have to be used in practically every case if an optional compression ratio higher than the standard one is chosen.

The only entirely new car this year seems to be the Nash Ambassador 600, which is intended to compete in the lowest-priced field for full-sized cars. It takes the place of the Nash LaFayette, but is a smaller car, the wheelbase being 112 instead of 117 in., the displacement 172 instead of 234 cu. in., the tire size 5.50-16 instead of 6.00-16, and the horsepower rating 75 instead of 95. The car is about 800 lb. lighter. Being an entirely new design, it naturally has a num-

ber of up-to-date features, including unit construction of chassis and body, suspension on coil springs all around, and independent front suspension of a type which has long been successfully used abroad.

The efforts to combine diversity of product with simplicity of manufacturing operations find a novel expression in the Oldsmobile and Pontiac programs. While Oldsmobile lists six different lines, it has essentially two different chassis and two different engines, a six and an eight, and each chassis can be equipped with either engine, at the option of the purchaser. Rear mountings for both engines are in identical locations on the frame, hence the same transmission and propeller shaft can be used, and the difference in the lengths of the engines results in different relations of the forward mountings to the frame front cross member. The displacement of the eight-cylinder engine is only 8 per cent greater than that of the six, and the difference between maximum torques therefore is slight. With the six-cylinder engine the fan naturally comes quite a distance back of the radiator, but this is allowed for by providing it with a shroud.

The new methods of treating ferrous surfaces chemically to improve their bearing qualities, which were specially developed for use on piston rings, have found application also to other engine and chassis parts. Chevrolet, for instance, has dispensed with bronze bushings inside the hubs of the valve rocker levers, which latter are made of a special type of high-tensile cast iron. The hubs are diamond-bored, and the bearing surfaces are then "granodized," which is claimed to prevent scoring and scuffing when the rocker levers bear directly on the steel shaft. Chevrolet applies the same treatment to the shifter yokes in the transmission. Cadillac this year has changed from a forged steel to an alloy cast-iron camshaft, and the use of cast camshafts is now nearly universal in the passenger-car field.

With increase in engine speeds, bearing loadings have constantly increased and there has been recurrent trouble, especially with connecting-rod big-end bearings. Various expedients have been resorted to in the past to prevent such trouble, such as forced ventilation of the crankcase, the use of oil coolers, and adoption of bearing materails less sensitive to heat than ordinary babbitt. One source of trouble with bearings is an insecure bond between the lining and backing materials. To secure a good bond it has been customary in the past to first tin the steel backing before applying the bearing alloy, a special procedure being followed. A new process of "white-metalling" bearing shells has now been developed by General Motors Corporation, and bearings produced by this process are being furnished to a number of engine plants. The bearing metal used is a high-lead babbitt, which has a higher melting point than standard babbitt and is used in extremely small thicknesses, projecting only a few thousandths of an inch above the bonding material. The backing is of steel, and an intermediate layer or coating of sintered metal is used. This consists of a mixture of powdered copper and nickel in the proportion of 60:40, which is fused to the steel in an electric furnace. These sintered metal particles form a matrix which is later impregnated with the molten bearing metal, and it is easy to understand that by this process a very secure bond is obtained both between the sintered-metal matrix and the steel backing and between the matrix and the bearing alloy.

A firm specializing in engine bearings also has developed a new steel-back bearing in which the lining of bearing alloy is extremely thin, and this also has come into use in passenger-car engines.

The Brass Hat-Rack

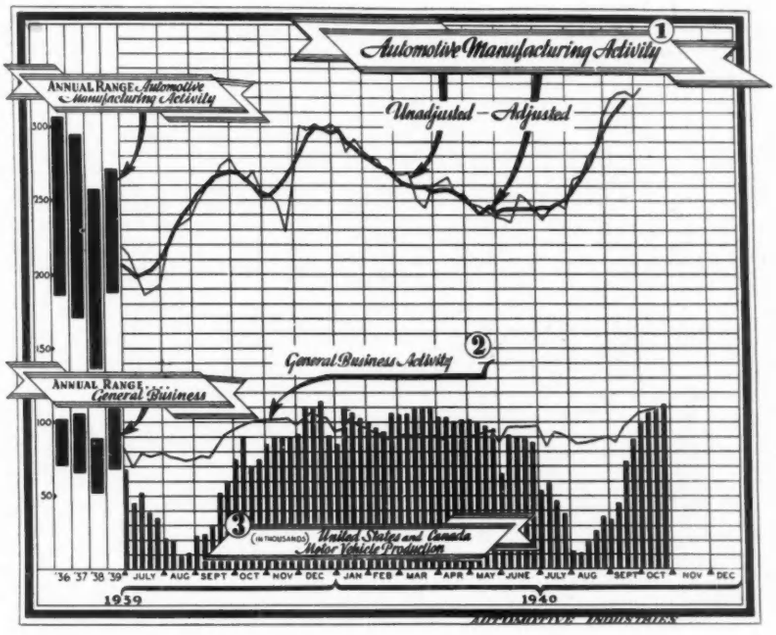
"Humphreys, is it true that I inspired the design for our front fender?"

While not so much emphasis has been laid on fuel-economy in sales talk in recent years, it is still a factor, and under severe competitive conditions it may become of importance. Specific fuel consumption for cars of approximately equal weight depends more on carburetor performance than on any other factor. The best we can expect from a carburetor is that it shall give a substantially maximum-economy mixture throughout the delivery range, up to a point just short of full throttle, where the economizer feature is cut out. There is always a tendency for the mixture ratio to vary with the delivery rate. Of course, all carbu-

(*Turn to page* 486)

BUSINESS IN BRIEF

Our own view of automotive production and sales; authoritative interpretation of general conditions



Weekly indexes of automotive general business charted

October Output Tops 1939 Mark by 50%

PRODUCTION in the automobile industry during October reached a three - year peak with an output of an estimated[3] 500,000 motor cars and trucks, the largest single month's production since June, 1937, when the total was 521,153 units. This was 50 per cent higher than the production for October, 1939, when the Chrysler strike cut the total to 324,673 units, and also bettered the best previous month of 1940, April, by nearly 50,000 units. Output in April, as reported previously, was 452,433 motor cars and trucks.

The month's production also set a new record for October, the best previous total for the month being 415,820 units set in 1928. Output was approximately 109,000 units for the week ending Oct. 19 and it climbed to 112,000 cars and trucks for the week ending Oct. 26. It was expected to top 114,000 units for the succeeding week.

General Motors' output was estimated at 46,300 vehicles for the week ending Oct. 26, as Buick, Pontiac and Cadillac reached the highest production rate since 1937. Pontiac went on a six-day week for the first time in three years, while Buick was working nine-hour shifts. Chrysler divisions turned out 26,500 motor cars and trucks, with all divisions at or near capacity. Ford manufactured 22,300 units but was due to up production on Ford and Mercury models to 5300 units per day in November. Studebaker continued to top the independents, followed by Hudson, Nash, Packard and Willys. Nash hit a three-year high with 2100 cars coming off the assembly line.

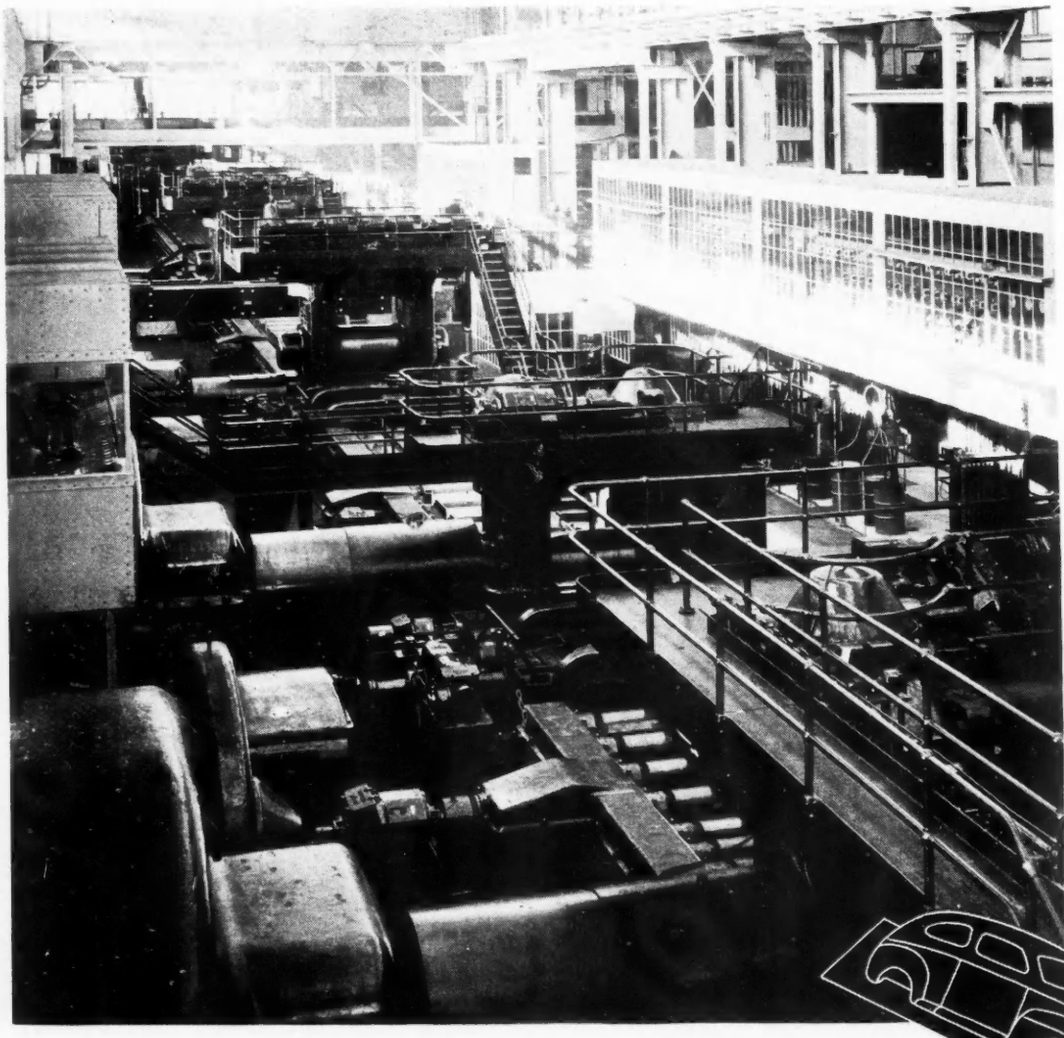
[1] 1923 average = 100; [2] Prepared by Administrative and Research Corp. New York. 1926 = 100; [3] Estimated at the Detroit office of AUTOMOTIVE INDUSTRIES.

October's production was far ahead of the official September total of 284,583 motor cars and trucks, compiled by the Department of Commerce. The September figure in turn was 48 per cent greater than September, 1939, and the highest output for the month in 11 years.

With the national automobile show in New York and sectional shows at Chicago, Detroit, Pittsburgh, Dallas and Los Angeles furnishing added impetus, October sales reports proved encouraging for the first 10 days of the month. Five divisions of GM delivered 55,572 new motor cars in the period, a gain of 132 per cent over the corresponding period of 1939. Buick and Oldsmobile established all-time highs for the period. Ford reported its dealers with the lowest inventories of new and used cars in recent years at the end of the 1940 model clean-up, with less than one new car per dealer and shortages in many places.

October new passenger car registrations showed a sharp increase over September, according to R. L. Polk & Co., an advance of 80 per cent being indicated from returns for the first 11 days of the month. Greatest increase was registered in the East South Central and South Atlantic regions.

Although September is rated the poorest selling month of the year due to the model changeover, new passenger car sales for the month totaled 157,418 units, according to the AMA, a 13 per cent gain over 1939. Truck sales were up 21 per cent in the same period. General Motors' consumer sales for the month showed a 72 per cent gain, while Pontiac, Studebaker and Hudson reported the best September sales since 1928-1929.



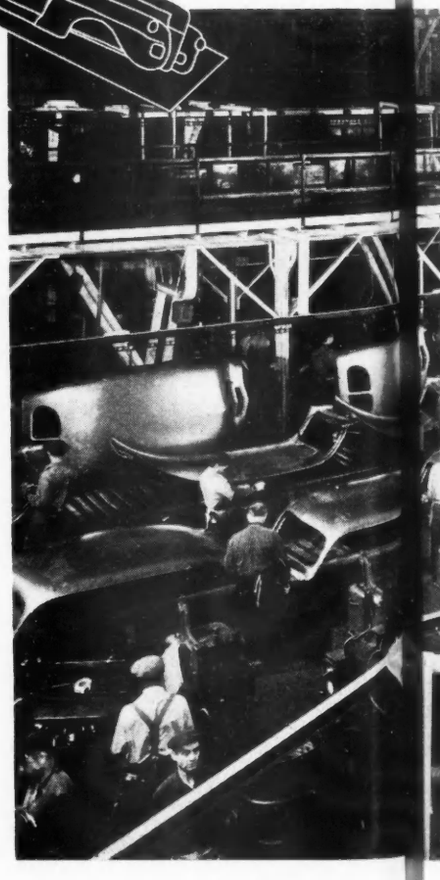
General view in the Ford strip mill.

By JOSEPH GESCHELIN

JUST short of a regulation mile in length, the combined steel mill and press shop of the Ford Motor Co., at River Rouge, said to be the largest structure of its kind under one roof, covers a ground area of over 64 acres. The beginnings of this gargantuan enterprise were announced early last year, the first units—press shop and tool and die shop—described in AUTOMOTIVE INDUSTRIES, April 8, 1939. The new operation now includes the open hearth, strip steel mill, rolling mill, cold roll mill, press shop, spring and upset forge, and rear axle.

It is an amazing fact that if we assume an uninterrupted sequence of operations, which is well within the limits of practicability in the Ford plant, it would take an interval of but 28 hours from the time a lake boat unloaded its cargo of ore at the dock to the time the steel emerged in a finished body, in the white, en route to the paint shop.

Let us trace briefly the cycle of events from the ore dock to the paint shop, marking well the significant details of one of the finest examples of constructive mechanization to be found anywhere in the world. First stage is the blast furnace, of which there are two 800-ton units, producing 1600 tons of pig iron



Roof top department, an extension of the line beginning with the huge presses, is an example of the manner in which the separate departments are made self-contained.

From the Ore Dock Through the Press Shop at Dearborn

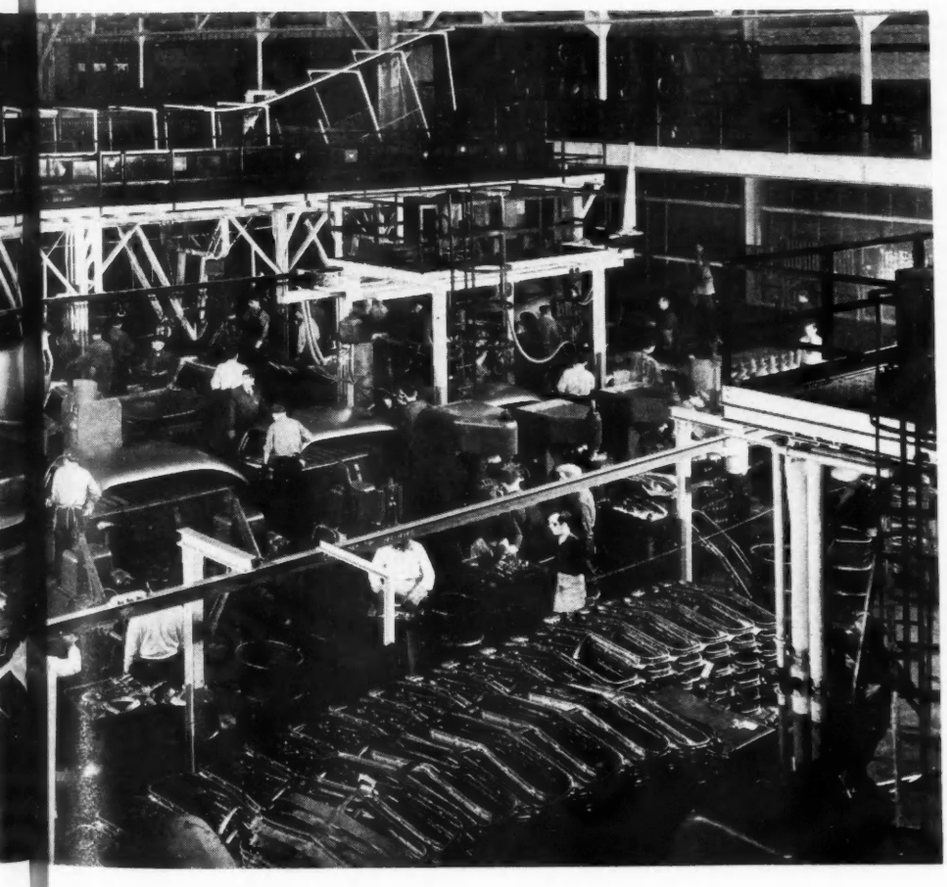
in 24 hours, each furnace being tapped every six hours.

The metal runs through suitable troughs to ladles and is delivered in special cars, in the molten state—to the foundry, to the open hearth, or to the pig cast house and then to storage.

The open hearth building forms the initial stage in the steel mill. Here will be found a battery of ten furnaces of the basic melting type—nine of 180-ton capacity, one of 400-ton capacity—the latter being employed almost exclusively in the preparation of metal for the strip rolling mill.

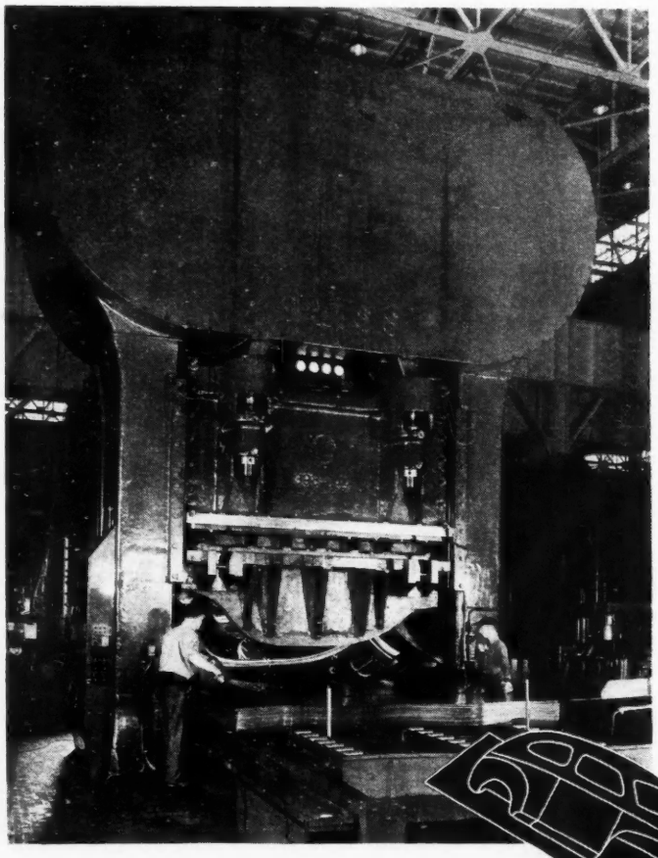
A charge for one of the 180-ton furnaces consists of about 48 per cent pig iron, 52 per cent scrap. Blast furnace iron is kept hot in two 600-ton metal mixers. Coal tar or fuel oil is used to fire these furnaces, which are capable of handling two heats of alloy steel or carbon steel every 24 hours. At definite intervals, samples are drawn from each furnace and immediately analyzed in the metallurgical laboratory located in the same building.

At the completion of a heat, the furnace is tapped and the charge run into 185-ton capacity ladles at a temperature of about 3100 deg. F. The ladle then is carried to a pouring "dish" where it is tapped from the bottom. From the pouring dish, the metal flows into ingot molds, cast in two standard sizes—6000 lb. and 20,000 lb. The ingots, still red hot, then proceed to the soaking pits where they are heated to the rolling temperature of about 2300 deg. F., in gas-fired furnaces. After soaking for 4 to 5 hours, the ingots are drawn out by tong cranes, dropped onto transfer cars and carried to the ingot run.



Sheet metal for body and fender stock goes, first, through the blooming mill, the hot strip mill, and then through the cold roll mill where it is finished to the required gages and finish. Some of the heavy gage stock, as finished in the hot roll mill, is used except for scale removal without further processing for parts such as frames. It is of interest to note that all of the sheet steel is handled in coils to facilitate transportation, and is readily accommodated in that state in blanking presses in the press shop.

Major units in the hot mill include the blooming mill, shear, three re-heating furnaces, scale breaker, broadside mill, one two-high and two four-high roughing stands with three vertical edgers, one delay table, five four-high finishing stands, rotary flying shears and two coiling reels. In the cold



This Bliss press is one of the battery of pressess used in forming the roof top stamping.

mills are pickling tanks, coiling and welding machinery, three four-high tandem mills, an 84-in. reversing mill, bright annealing furnaces, and two tempering mills.

The 6000-lb. ingots from the reversing blooming mill are delivered to the 42-in.-32-in. continuous blooming mill and go through four sets of 42-in. rolls for conversion into a bloom. The ends then are cropped and the bloom is sent through four sets of 32-in. rolls that transform it into a billet. If the metal is to be used on the 14-in. mill, the billets are sent to the shear, then to the cooling beds, and finally to the chipping rooms. If the metal is intended for the 10- or 12-in. mill, it is sent direct from the blooming to the 18-in. mill to be rolled into smaller stock.

The hot strip mill is designed for the production of strip in gages as light as No. 18 and in widths up to 58½ in. The cold mill is designed for gages from Nos. 15 to 25, and widths up to 78 in.

Strip steel is rolled into 2½-ton coils on reels at the end of the hot mill run-out tables at the rate of 1200 ft. a min. From the coiler it is conveyed to the cold mills, where coils are welded together and then sent on a five-hundred-foot trip through mechanized continuous pickling tanks.

The schedule of mill operations is as follows:

10-in. mill rolls cold heading wire and small bars under 1 in.

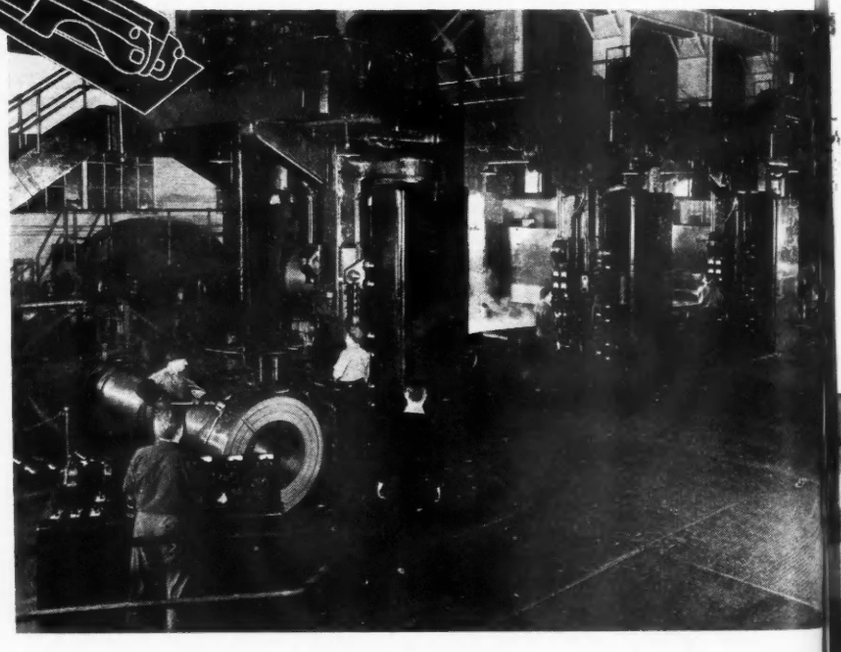
12-in. mill rolls spring steel.

14-in. mill rolls forging bars.

18-in. mill rolls billets for smaller stock.

The steel mill is a marvel of engineering employing the most modern devices for the automatic control of temperature and other functions, with remote station control of machinery cycles. Good housekeeping coupled with design for safety lend an atmosphere of quiet and dignity which mask the relentless tempo of a high production mill. So smooth and so quiet is the operation that the only outward evidence of activity is the rush of long strip to the coiler and, at regular intervals, the hiss of steam as streams of water for cooling the rollers strike the hot sheet metal.

Some idea of the extent of this operation may be gaged from the fact that the steel mill produces from 2500 to 3000 tons of metal per day, of 26 different analyses. The plant has a floor space of 1,285,970 sq. ft., and is 1710 ft. in length.



The press shop, which is under the same roof, contains 1,500,000 sq. ft. of floor space, covers 19½ acres of ground, now boasts 3,600 pieces of equipment including 300 of the imposing three-story presses supplied by Clearing, Bliss, Hamilton, Cleveland, Southwark, and Toledo, with sub-bases weighing 40 tons or more anchored in the floor-level basement. Much of this equipment is of triple-action type weighing upwards of 350 tons each.

Interesting commentary on the Ford way of doing

Sequence of operations on front fender

Blank
136 in. Bliss blanking press

Oil and **process**
Roller

Preform

Draw
108 Clearing press

Trim
120 Clearing press

Trim and **flange**
96 Hamilton press

Pierce (lamp opening)
54 Bliss press

Restrike (lamp opening)
54 Bliss press

and **Start flange**
66 Cleveland press

Flange body side
120 Cleveland press

Flange and **restrike** running board end
100A knee type Bliss press

Finish trim and **pierce** lamp opening
545½ Hamilton press

Restrike lamp opening
95 C Toledo press

Curl nose and **emboss** body flange

Pierce lug

Curl outside
94 in. Toledo press

Restrike hood and shell for angle
VA 80 Niagara press

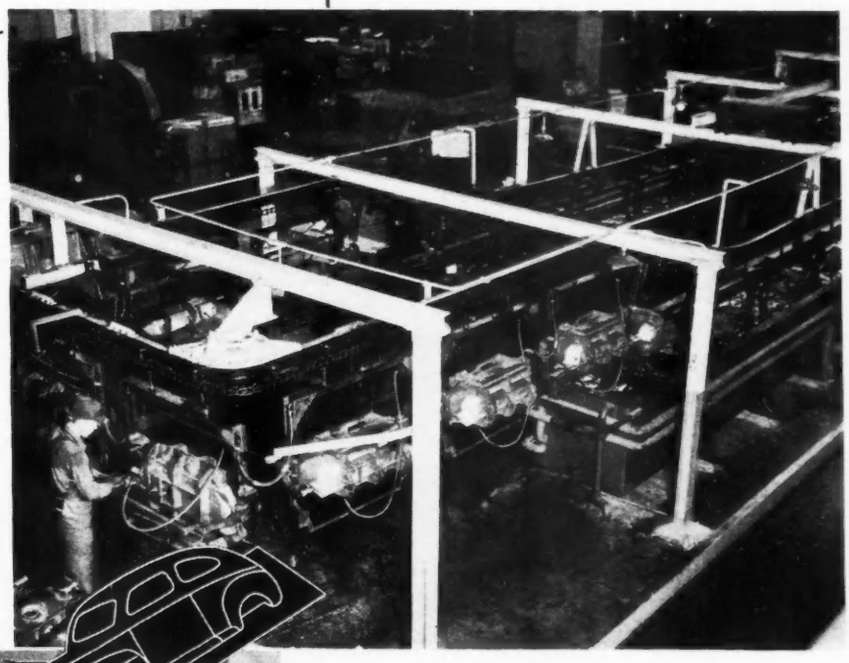
business is that a quick inventory of the press shop equipment would serve as a roster of the familiar names of fine press makers including Clearing, Bliss, Toledo, Cleveland, Hamilton, Minster, and Southwark.

The structure, with its floor-level basement, is really a three-story affair with major press operations on the main or second floor. Mechanized materials handling, characteristic of Ford methods, has been developed to a remarkable degree, expressed in a conveyorized system some 10 miles in length.

Major press operations have been skillfully arranged on the main or second floor gallery, with press lines for each item laid out in parallel rows along the length of the building. Some impression of the scope of operations may be gained by considering that this press shop turns out the entire volume of body stampings, fenders, and small sheet metal parts for Ford V-8 passenger cars and trucks, Mercury cars, and the Ford tractor gas tank and sheet metal parts. Body models include the Ford Tudor, Fordor, Coupe and Sedan Delivery; and the Mercury Tudor, Fordor, and Sedan Coupe.

Some of the major stampings produced in the press shop are listed on page 481.

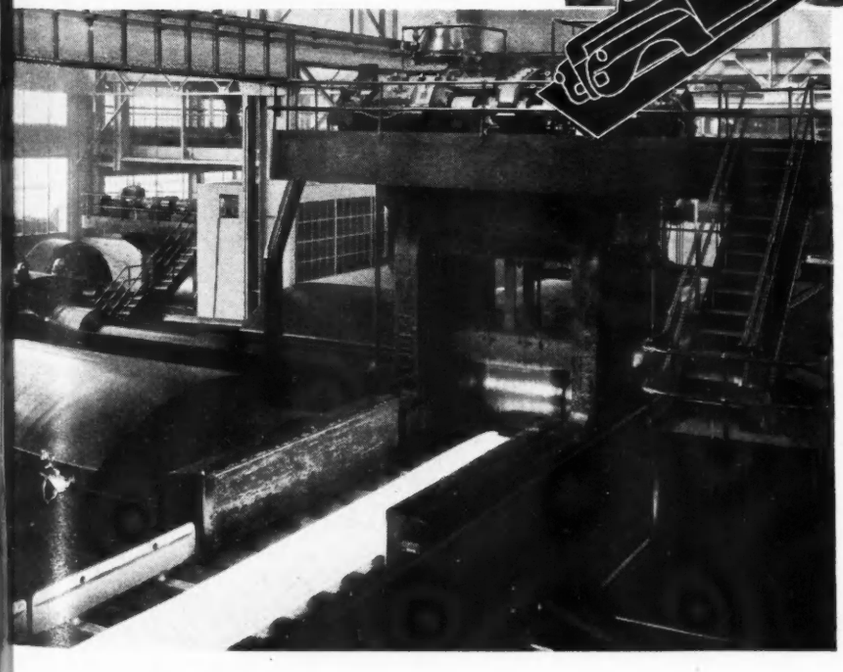
As mentioned earlier, sheet metal comes in from the adjoining steel mill in 10 to 12-ton coils or rolls which sometimes measure a mile in length. Each of the press



(Left) Hot rolled strip about to be uncoiled and made ready for the cold roll mill.

(Right) Unique is this automatic gas tank tightness testing machine, one of two installed in the gas tank department. The tanks are mounted in special cradles on the monorail, fitted with an air line which impresses a high pressure on the interior. Operators then watch each tank for air leaks.

(Below) Close-up of one of the blooming mill stations.



lines is headed by a blanking press fitted with a massive, automatic, feeding reel with slack adjustment suited to the operation of the die. Each of the blanking presses is designed for automatic blank ejection. In operation, as the press ram starts its return stroke, a row of vacuum cups engages the blank or blanks and carries them upward. At this point an unloader consisting of a row of bars attached to a reciprocating chain mechanism slides in over the press bed. The cycle is so timed that at this point the vacuum is broken and the blanks drop onto the unloader which then moves rapidly outward to discharge them.

As an example of press shop management, we give on page 479 a typical sequence of operations on a front fender with its characteristic lamp opening.

One of the most impressive operations is found in the gas tank department which produces tanks for Ford cars and trucks, for the Mercury, for the Lincoln-Zephyr, and for the tractor. Here is a large battery of the latest type seam welding machines and two huge automatic testing tanks in which the gas tanks are rapidly checked for tightness with internal air pressure. Another feature of the gas tank department is a large, well ventilated, enclosed booth housing all of the soldering operations.

It may be well to note at this point that each of the press lines serves its own self-contained department comprising facilities for detail welding operations, metal finish, etc., as exemplified in lines for the top, sides, doors, underbodies, and the like.

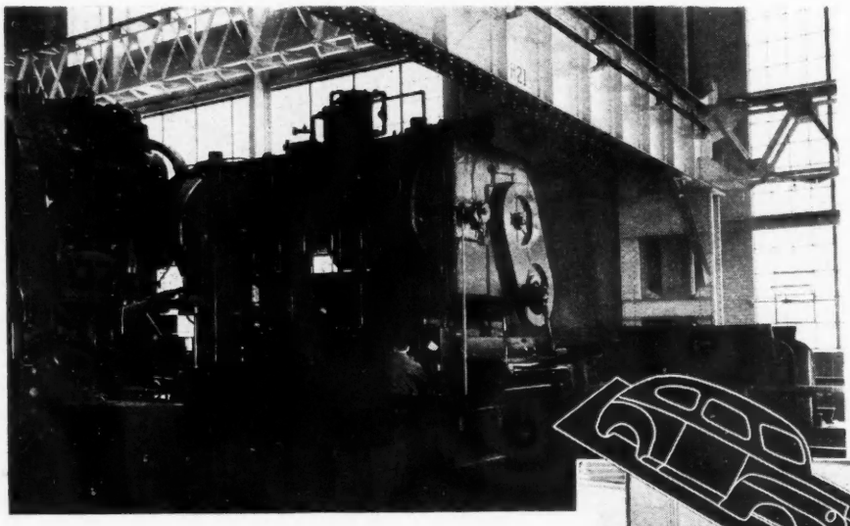
For an example of the multiplicity of detail operations on major parts of the body, we point to the door assembly. Although to the eye this appears to be a relatively simple part, actually it is composed of 168 separate parts, requiring 111 die operations in their fabrication.

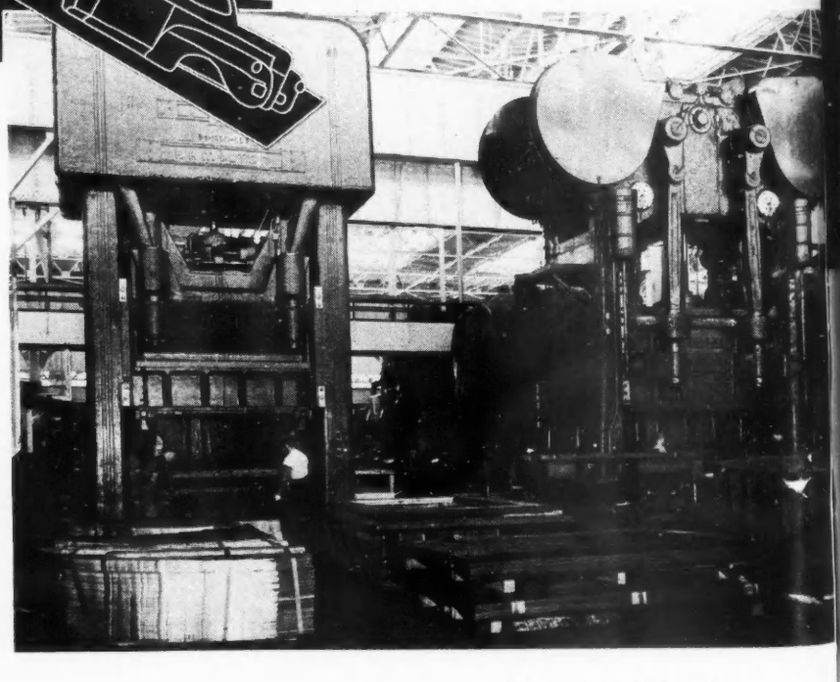
One of the largest items of equipment is the triple-action Clearing press used for producing sedan delivery side panels. Another of the major operations is that of making the top panel which, on Ford cars, is a single stamping extending from the extreme front end of the cowl down to the trunk lid opening. This stamping is produced in four separate press operations, with press dies weighing some 70 tons per set.

Housekeeping in the press shop is a revelation to any one familiar with an enterprise of this size. The handling of scrap is quite unique. Instead of collecting scrap from the forest of presses and then baling it, as is customary, the kind of scrap that cannot be salvaged is cut up in chopping machines provided in various departments, dropped down chutes to a scrap conveyor, and transported to the open hearth for re-melting.

Much of the scrap, such as the trim on large panels and sizable sections such as door and window opening blanks, is salvaged on the first floor gallery. Here it is rerolled, punched out for various, small, body interior details in a special department provided with small presses of familiar types. Typical example of salvage scrap management may be noted by reference to the guide panel posted in this department, illustrated in the pictorial section.

The press shop is the source of all body parts for River Rouge as well as for all of the Ford assembly plants. The schedul-





(Left) Heading practically every major press line in this plant is a Bliss blanking press, as shown here, which produces blanks directly from coiled strip. Each of these presses is fitted with the automatic blank unloading device described in the text.

(Below) Typical of the large equipment in the Ford press shop are the Hamilton and Toledo presses shown in this view.

ing of parts, therefore, routes a certain percentage directly to shipping dock, the remainder to the first floor of the press shop where bodies in the white are produced for River Rouge assembly. Outgoing body parts and fenders are transported on the impressive shipping conveyor some four miles in length.

Bodies in the white for use at River Rouge are assembled completely in a compact department on the first floor, where the triple-action press sub-bases may be seen. Finished bodies are transported directly to the paint shop.

This brief high-spotting of the press shop would be incomplete without some mention of the excellent and extensive die repair and press maintenance department on the main floor. Some idea of its scope can be appreciated from the fact that among the many items of expensive equipment are two of the largest Keller machines known to the trade, supplementing a large battery of such machines in the tool and die shop.

Novel pieces of equipment in the press shop, possibly the first examples of their kind are

(Above) Close-up of one unit of the large battery of seam welding machines in the gas tank department. This is set-up for the V-8 gas tank.

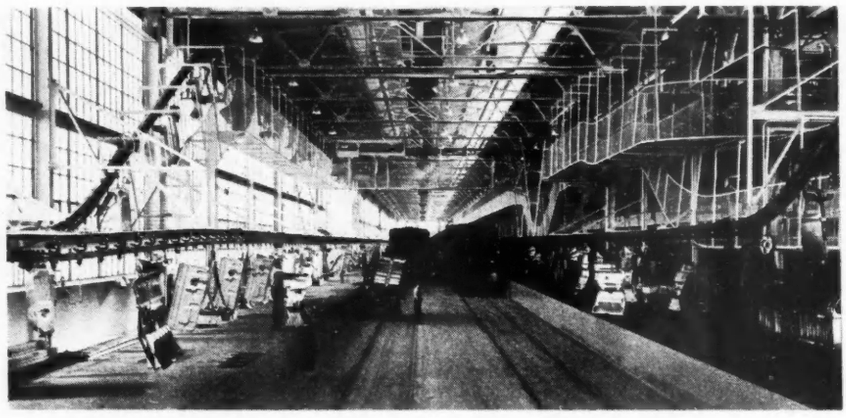
(Left) Among the many Clearing machines found in this plant is this battery of fender draw presses.

Some of the Major Stampings Produced in Press Shop

91-A Roof Top Assembly
Body Side Assembly R.H. Tudor
Body Side Assembly L.H. Tudor
Body Side Assembly R.H. Fordor
Body Side Assembly L.H. Fordor
Deck Door Assembly
Door Assembly R.H. Tudor
Door Assembly L.H. Tudor
Door Assembly R.H. Coupe
Door Assembly L.H. Coupe
Door Assembly R.H. Fordor, Front
Door Assembly L.H. Fordor, Front
Door Assembly R.H. Fordor, Rear
Door Assembly L.H. Fordor, Rear
Dash Assembly
Hood Top Assembly
Hood Side Assembly
Instrument Panel Assembly
Tractor gas tanks
Tractor hoods
Rear Floor Panel
Front Floor Panel
Radiator Shell Sets
Front Fender Apron Sets
Front Fender Assembly R.H.
Front Fender Assembly L.H.
Cowl Vent and Deflector Assembly
Fuel Tanks
Engine Pans
Radiator Shell Apron Assembly
Seat Back Assembly, Front

Trucks

99-A Fuel Tanks
Seat Back Assembly, Front
81-C Radiator Shells
81-T Fuel Tanks
81-T Engine Pans



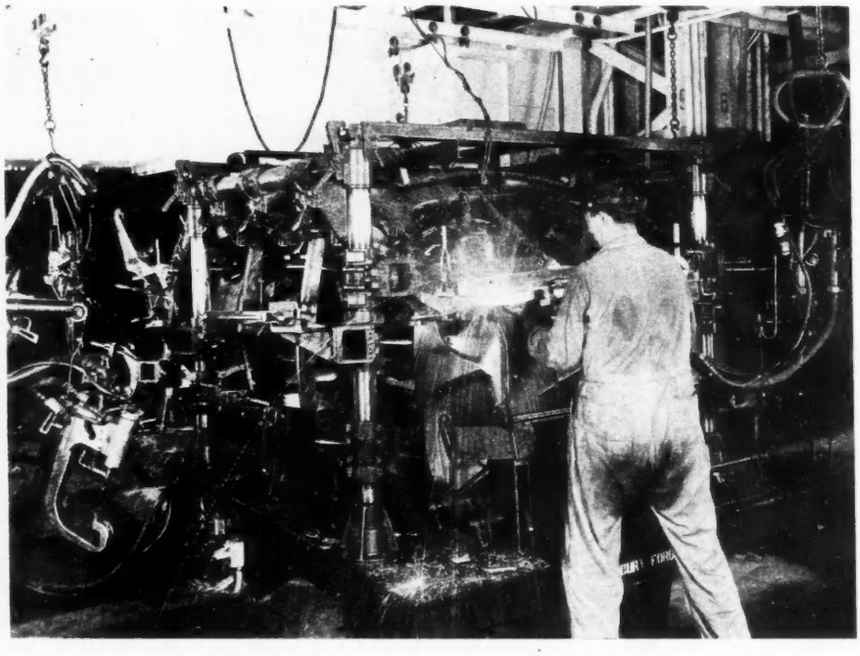
A perspective of the shipping dock from which the body parts are distributed to Ford assembly plants.

traveling cranes of 20 to 90 ton capacity, fitted with huge cradles for transporting heavy loads. These load carriers enable the operators to pick up a load, move it into the safety device, and carry it over the heads of the workmen with the greatest degree of safety.

Supplementing the earlier reference to the blast furnaces, it may be noted that coke and limestone are fed in along with the ore, the average charge for an 800-ton furnace consisting of 25,500 lb. of iron ore, 4600 lb. of limestone and 12,000 lb. of coke. These charges are put into the furnace through a hopper at the top and are leveled off into layers of rounds with several large bells. An average of 117 charges is dumped into the furnace over a 24-hr. period.

The blast furnace blower room is located at the power house where three centrifugal blowers can furnish 185,000 cu. ft. of air per minute. This air is supplied under from 15 to 35 lb. pressure and is sent through huge stoves where it is heated to 1000 deg. Fahr. before being used as a blast in the furnace. Although there are four stoves to each furnace the air only circulates through one of them, the other three being spares. These, however, being used in rotation, at one hour intervals.

Coming to the open hearth building, we find that coal tar or fuel oil is used as fuel for the furnaces, the fuel being reversed from one end to the other every 15 to 20 min. to assure uniform heat as well as to preheat the incoming air.



Close-up of one of the huge steel welding bucks used for final assembly of the Ford body structure. A large battery of these machines is found in the basement gallery.

Pouring temperature from the furnace ranges from 3050 to 3100 deg. Fahr., the metal feeding into 185-ton ladles which are carried by crane to a pouring dish, the latter tapped from the bottom, and the metal poured into ingot molds.

The ingots then are brought to the soaking pit building, where they are lifted out of the molds, one at a time, by a tong crane that deposits them in the soaking pits. There are gas fired furnaces in which the ingots are heated uniformly to rolling temperature, normally about 2300 deg. Fahr.

After soaking in this heat for from four to five hours, the ingots are picked out by other tong cranes and dropped onto a transfer car that carries them to the ingot run. The run—a series of fast moving rolls—then carries the ingots to the 44-in. reversing blooming mill.

The 5000 and 20,000-lb. ingots pass through the blooming mill. The 5000-lb. alloy or bar steel blooms can be reversed back to the continuous blooming mill while the larger blooms proceed through the strip mill.

It is important to note that the foregoing outline of the operation of the steel mill and press shop was written some time before the 1941 models were placed in production. For this reason, the tooling of some of the items of equipment in the press shop does not reflect the latest detail changes.

Design of High Speed, Two-Stroke Engines

By Scipione Treves, D.Sc., Mech. Engr.*

Section Seven

In this the concluding section the author explains the application of the principles presented in previous sections. This series has appeared in all July, August and September issues of Automotive Industries and in this the November 1 issue.

From what was said in the preceding instalments of this series, the great possibilities of the two-stroke engine in the automobile and aircraft fields can be readily seen. Its fundamental advantages over the four-stroke engine are a higher degree of uniformity of torque and greater robustness, as the engine does not comprise any delicate parts, such as valves and springs, which are subject to high periodic stresses. To these must be added the higher specific output.

The uniformity of the torque is evidently much greater, since with the same number of cylinders and the same speed of rotation, the number of power impulses per unit of time is doubled. The robustness and reliability of the engine are due, not only to the absence of a complicated valve mechanism, but also to the experimentally-confirmed fact that the two-stroke engine heats less than the four-stroke, probably because the exhaust period is considerably shorter in the former. Its reliability is not at all impaired by the presence of a rotary blower, which latter is now a standard product and quite free from inherent weaknesses. It evidently would be an error to sacrifice a possible increase in power and efficiency merely to avoid the slight increase in complication resulting from the addition of this part, which is used also on many four-stroke engines, and particularly on aircraft engines intended for operation at high altitudes.

The greater specific outputs result primarily from doubling of the number of working strokes, and in the second place from the fact that even higher speeds are possible than with four-stroke engines, provided only that the weight of reciprocating parts is not excessive, as sometimes happens in engines with deflectors on the pistons. The argument that a smaller mass of fresh charge is admitted to the cylinder during each cycle is not valid, as recourse is had to supercharging in the case of both two-stroke and four-stroke engines.

In order to increase the mass of air in the cylinder at the moment compression begins, it is well to cool the air before it is admitted to the cylinder, or, alternately, to throttle the exhaust, thus raising the pressure of the entire cycle.

Both of these methods of increasing the specific output were applied in experiments conducted by Junkers on a large Oechelhäuser engine. It was found that when the air is cooled before entering the cylinder, the output varies substantially in direct proportion to the mass of air taken in by the engine.[1] Less positive results were obtained when throttling the exhaust gases, owing to the increased power absorbed by the blower when working against higher counter-pressures. Similar experiments made on the gasoline engine of which characteristic curves were shown in Fig. 15, led to substantially the same conclusions as regards the effect of cooling the charge, which was accomplished by means of a cooler formed by two large collectors or headers connected by small round tubes through which strong cross currents of cold air were forced by a blower. As to the effect of throttling the exhaust, which was accomplished by using, in place of short-length exhaust pipes giving a practically free exhaust, pipes made of sheet metal and having corrugations in them transverse to the direction of gas flow. Overheating of the engine, and especially of the pistons, resulted and made steady operation of the engine and brake readings impossible.

Practically the only disadvantages are the difficulty of properly cooling the pistons, at least in designs of high speed and high specific output, such as those employing two opposed pistons per cylinder and uniflow scavenging, and the greater specific fuel consumption. The first difficulty is similar to that experienced in connection with the cooling of exhaust valves of aircraft engines some years ago. And since it has

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[1] The same result has been arrived at in a study of supercharging of four-stroke engines. See S. R. Treves, "Supercharging", The Automobile Engineer, August, 1926, Vol. XVI, No. 218, p. 283.

been found possible, by the development of suitable methods and materials, to obtain quite satisfactory results from exhaust valves, as regards their seal and their life, it seems logical to expect that if similar development work were done on the two-stroke engine, similar results would be achieved.

More difficult to deal with is the vexed question of the lower thermal efficiency. The inferiority of the two-stroke engine from this point of view is due—omitting the less important causes—to the power loss in the large supercharger, to the incomplete utilization of the power stroke owing to the presence of the ports, and chiefly to the loss of fresh charge through the exhaust ports. As regards the first item, it might be objected that this holds only in a comparison with a non-supercharged four-stroke engine, for, as explained in Section VI, the necessity of working with lower charging pressures in the case of two-stroke engines reduces the power required to operate the supercharger to values which, in spite of the larger capacity required may be smaller than that required to operate a supercharger for a four-stroke engine.

As for the escape of unburned fuel, this depends on the cylinder design and on the port timing, as well as on the size and shape of the exhaust pipe. The specific consumption is influenced also to a considerable extent by the design of the carburetor. Owing to the fact that, as a rule, the latter is subjected to blower pressure and must satisfy a number of other fundamental requirements, it must be designed on rather different principles from those applied in the design of carburetors for engines with atmospheric induction. In order to increase the thermal efficiency, first of all the stratification must be improved, so that the mixture on entering the cylinder is free from vortices and disturbing movements, and will pass through the cylinder at low speed, the form of which should be such as to permit of streamline flow as far as possible. Moreover, as already pointed out, in order that the charge may not enter at high speed and force one or more short circuits through the mass of burnt gas, the delivery pressure of the blower should not greatly exceed the counter pressure in the cylinder; in other words, the supercharge ratio should be kept low.

It would evidently be possible to improve the fuel-consumption figure by scavenging with a separate current of pure air, which in the opposed-piston type of engine could be accomplished by providing rotary valves just ahead of the inlet ports, on opposite sides of the cylinder block, one controlling the current of pure air, the other that of combustible mixture. It must be remembered, however, that, aside from the increased complication which this arrangement involves, scavenging by pure air in this manner considerably increases the friction and pumping losses, and makes it necessary to increase the capacity of the blower and divide its output into two parts, one of which is delivered to the carburetor, while the other part, in order that its pressure may be no higher, must be passed through a throttling device. Under these conditions the mechanical efficiency is greatly reduced, particularly at low load, and the thermal efficiency may not be improved at all.

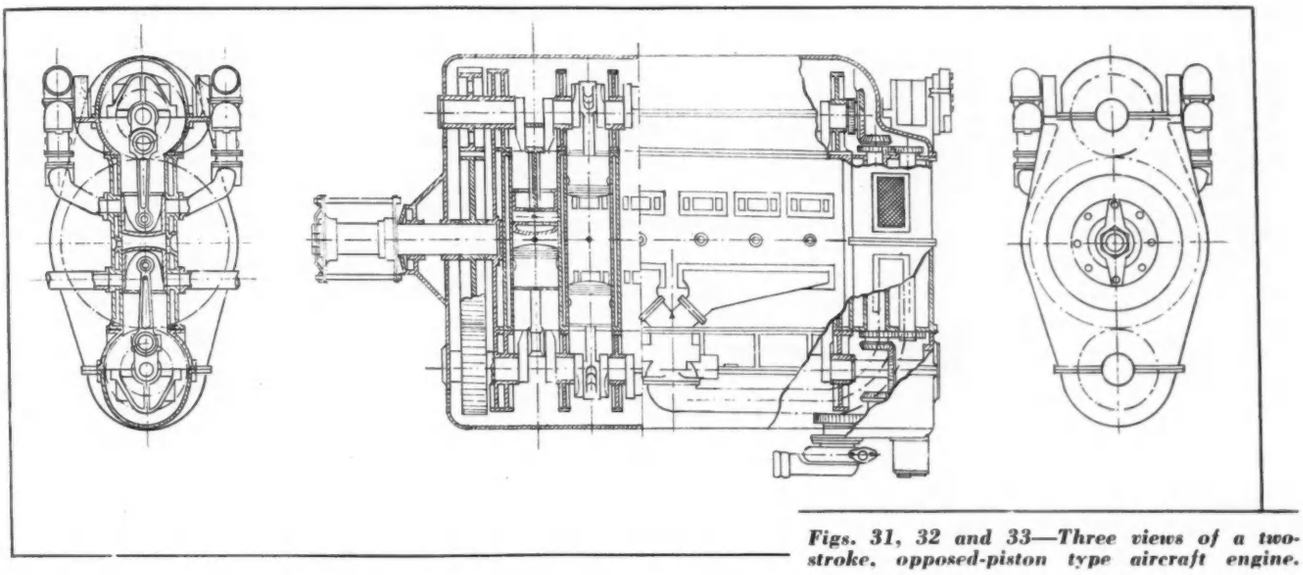
The scavenging problem is greatly simplified in the case of Diesel engines, in which fuel is injected only toward the end of the compression stroke, and speed and power control is effected by varying the quantity of fuel injected, there being no change whatsoever in the scavenging process, since the same amount of air is introduced during each stroke regardless of the load on the engine. As regards the gasoline engine, as explained in Section I, the difficulties inherent in fuel injection are such that for the present at least the outlook with respect to the practical development of such engines is not very encouraging.

From the foregoing brief comparison of the advantages and disadvantages of the two-stroke and four-stroke engines, it may be concluded that supercharging is essential in the case of the two-stroke, as it alone makes possible efficient scavenging and a considerable increase in the outputs per unit of weight and of displacement, which by careful development may be combined with a moderate fuel consumption. The chances of future commercial success lie in the development of the supercharged type and—contrary to the lines followed up to now—in abandoning at the very outset the aim at maximum simplicity.

The most promising applications of the two-stroke engine at the present time are to racing or sports-model cars and to aircraft. For racing cars, built under the present international racing rules which place a limit on the piston displacement, the two-stroke engine has much to recommend it. The present rules, which limit the piston displacement and make absolute speed the criterion of achievement, are entirely in conformity with the spirit of racing crowds, who admire speed above everything else and evince little interest in victories based on complicated fuel-consumption and traction formulas. The same applies almost equally to cars built for sportsmen, who primarily demand a powerful engine, fast and reliable, which requirements are fully met by the two-stroke engine.

Less easy would be the application to stock cars—at least at first. In spite of the absence of valves and valve gear, the two-stroke engine, and at least the opposed-piston type, would be somewhat more expensive to produce, owing to the requirement of a blower and doubling of the number of such parts as crankshaft, connecting rods, and pistons. No doubt, the uniflow type with communicating parallel cylinders would be cheaper to build, for while it retains many of the advantages of the opposed-piston type, it has only a single crankshaft, to which the various pistons are connected by a special crank train, and it requires no gear train between two crankshafts. It must also be remembered that the difficulty in inserting an efficient muffler in the exhaust line will result in more noise in operation than in the case of engines of large cylinder displacement as now fitted to fine cars by the leading firms. Finally, fuel economy is certainly one of the most appreciated qualities of stock touring and town cars.

Against this may be set the simplification in the transmission made possible by the high torque of the two-stroke engine even at low speeds. A comparison of the torque curves of two engines of the same piston displacement and speed suggests that a two-stroke



Figs. 31, 32 and 33—Three views of a two-stroke, opposed-piston type aircraft engine.

engine with only a two-speed (and reverse) transmission will give the same rear-axle-torque range as the four-stroke engine with the conventional three- or four-speed transmission.

There is the further possibility of operating the two-stroke engine at higher speeds, thereby making possible a further reduction in the piston displacement, or, alternately, an increase in driving torque, permitting of higher rates of acceleration and quicker get-aways. Besides, the number of spare parts that must be carried is considerably reduced.

The two-stroke cycle presents notable advantages when applied to aircraft engines. It gives an engine of low weight per unit of output. Thus, for instance, the engine described in Sections IV and V weighed a little less than 310 lb. complete with blower, pumps, inlet and exhaust manifolds, cooling water and crankcase oil supply, which corresponds to 1.76 lb. per horsepower at 6000 r.p.m. This specific weight, although already quite low and comparable with that of modern aircraft engines without supercharger and reduction gear, may be decreased still further in the case of the larger piston displacements demanded by the aircraft industry, since the total weight increases less rapidly than the piston displacement, for obvious reasons.

It may be pointed out in this connection that modern developments in aircraft design are all directed toward flying at high altitudes, which alone permits of the high speeds that are the fundamental aim of all air travel. Hence a super-charger must be used in any case, and since in a two-stroke engine the application of a blower is effected more easily and without complications in design, it is really the most logical type for that purpose.

Since propeller speeds generally are limited to 1600 -1800 r.p.m., in order to avoid excessive centrifugal stresses and—above all—not to cause too great a decrease in the aerodynamic efficiency due to the phenomenon of cavitation, a reduction gear must be used, particularly with engines of high speed and high specific output, and such reduction gears always are heavy and bulky and lower considerably the mechanical efficiency of the powerplant. In this connection the opposed-piston type of two-stroke engine offers the advantage that the train of gears connecting the two crankshafts may be used as a reduction gear, and that a design of unusual strength and compactness may be developed.

An example of a two-stroke opposed-piston-type aircraft engine is shown in Figs. 31, 32 and 33, in which the propeller shaft is located at one end and carries a gear which meshes with pinions on the forward ends of the two crankshafts. At the opposite end, behind the cylinder block, is located the rotary blower, its design and location being such that it does not add to the overall dimensions of the engine, as determined by such accessories as the pumps, magnetos, etc. The gears for the propeller and blower, together with their housings of light alloy, constitute two strong ties between the upper and lower crankcases.

Another very convenient arrangement, derived from a similar one adopted with good results for Diesel engines, is that in which there are three radial cylinders with their axes 120 deg. apart, with a single central combustion chamber.

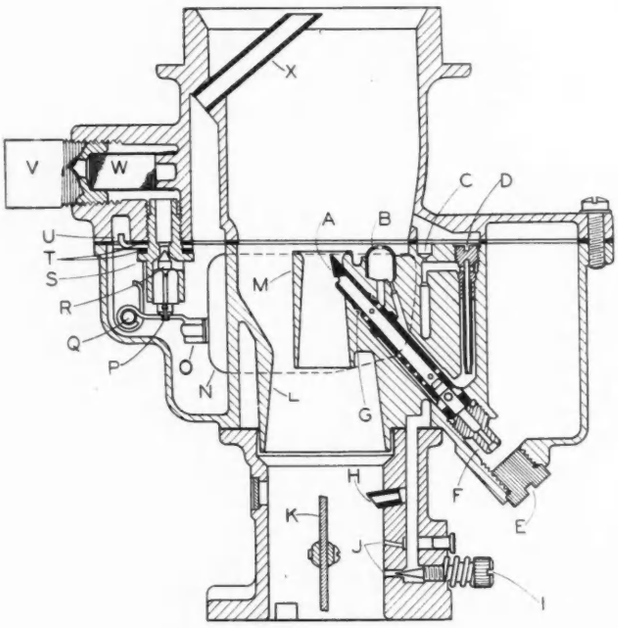
The foregoing detailed investigation of the possibilities and probabilities of application of the two-stroke supercharged engine clearly shows the vast and fertile field of study and experimental research which today is open to engineers familiar with this branch of engine development. The first experimental attempts, carried out in the technically-most-advanced countries of the world, have given rise to well-founded hopes, since brake mean effective pressures have been obtained that are from four to five times as high as those given by the old-style two-stroke engine with crankcase precompression, and today the two-stroke engine for automobiles and aircraft is no longer the impossible Utopia which it was considered only a few years ago.

At any rate, the direction of possible progress toward higher thermal efficiencies is clearly marked, and present development work and research is definitely based on the use of the rotary blower.

Trends in Design of 1941 Automobiles

(*Continued from page 474*)

retors have devices designed to neutralize this tendency, but they are not perfect in their action, and a curve of specific consumption versus engine speed under full-throttle conditions will always show irregularities, indicating considerable variations in the mixture ratio. The leanest mixture must be sufficiently rich so the engine cannot possibly misfire, and the mixture over most of the range is then considerably



Section through rear unit of Buick dual compound carburetor system.

A, main discharge jet; **B**, high-speed bleeder; **C**, idle air bleeder; **D**, idle tube; **E**, main-discharge-jet plug; **F**, main metering jet; **G**, main-discharge-jet lead gasket; **H**, secondary idle air bleeder; **I**, idle needle valve; **J**, idle discharge holes; **K**, throttle valve; **L**, primary venturi; **M**, auxiliary venturi; **N**, float; **O**, float lever; **P**, float-needle-valve clip; **Q**, float fulcrum pin; **R**, float needle valve; **S**, float-needle-valve seat; **T**, float-hanger gaskets; **U**, float hanger; **V**, gasoline inlet; **W**, gasoline strainer; **X**, float-chamber vent.

richer than the maximum-economy mixture, and operation is correspondingly less economical.

It will probably never be possible to develop a carburetor for liquid fuels that will deliver a mixture of absolute uniformity throughout the entire delivery-rate range. But the difficulty can be alleviated by dividing the entire range into a number of sub-ranges by the use of a number of fuel nozzles which come into action successively. All carburetors already have two sub-ranges. In the first of these, fuel is supplied to the incoming air stream by the idling nozzle, while during the second it is supplied by the main nozzle. The changeover from one nozzle to the other is not abrupt; the two nozzles overlap a certain delivery range, delivery of the idling nozzle fading away while that of the main nozzle rises. A further step in this direction has now been taken by Buick with its dual compound carburetor. Here the full delivery range is divided into three sub-ranges. In the first, fuel is delivered by the idling nozzle; in the second, by the main nozzle, and in the third by the main nozzle and a supplementary nozzle together. There are really two separate carburetors, both of the dual type, of which the forward one functions in the normal way. There are mechanical connections from the accelerator pedal to the throttles of both carburetors, but the mechanism is so arranged that the throttle of the rear carburetor begins to open only after the pedal has passed through something more than half of its stroke, and then opens very rapidly. Below the rear carburetor (between it and the manifold) there is a damper valve which is normally held close by an offset weight on its shaft. The damper vane is not a close fit on its seat and allows sufficient air to pass even when closed to enable the idling nozzle of this carburetor to function. When the throttle of the rear carburetor is opened and the engine has attained sufficient speed, the damper valve opens and the main nozzle of the rear carburetor begins to deliver fuel.

A somewhat similar effect was produced by the Ball & Ball carburetor used on early Chrysler cars. A difference between that and the present Buick carburetor seems to be that whereas in the Ball & Ball the coming into effect of the supplementary nozzle depended solely on the throttle position, in the Buick it depends solely on the inlet-manifold vacuum, which, in turn, is dependent on two factors, the throttle position and the engine speed.

Improvement in Ignition

Chrysler later discontinued use of the Ball & Ball carburetor, and with it the three-stage carburetor action, but in the announcements of this year's lines it was stated that the engines are equipped with a new multi-jet carburetor, one jet serving for idling, another for normal driving, and the third coming into action when the driver depresses the accelerator pedal beyond a certain point.

An improvement in ignition equipment of a more or less fundamental nature appears on the Chevrolet this year. Of the various parts of the ignition system the one requiring the most attention probably is the "breaker," whose points are likely to get rough and will then make poor contact, thereby cutting down the primary current and reducing the energy of the spark. Roughening of the contact points is due to the fact that some of the metal of one point is transported by the current to the other. The direction in which metal is thus transported corresponds to the direction of current flow. Chevrolet now incorporates a revers-

ing switch in the primary circuit of its ignition system. This reversing switch is actuated by the starter switch, in such a manner that every time the starter is turned on by depressing the starter pedal, the current through the breaker of the ignition system is reversed. This should result in substantially equal transports of metal in both directions, and the surfaces of the contact points should remain flat.

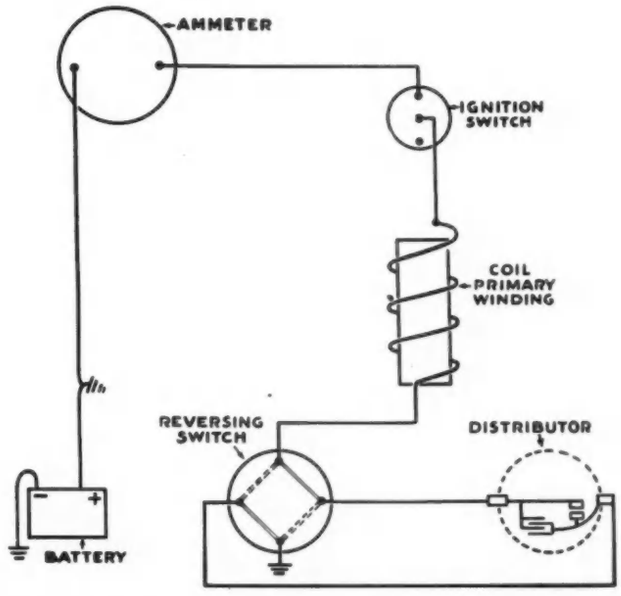
Again this year a number of makes have moved the battery to a position under the hood, and the present outlook is that this will be the standard location in the near future. Under the hood the battery is more accessible for service operations, and its terminals are better protected against splashing mud and water. The only disadvantage of this new location would seem to be that the battery is more exposed to heat from the engine, and the rate of electrolyte evaporation would be expected to be higher, but this objection can be effectively met by suitable means. In the Hudson the battery is located at the side of the radiator core, where it is fanned by cool air.

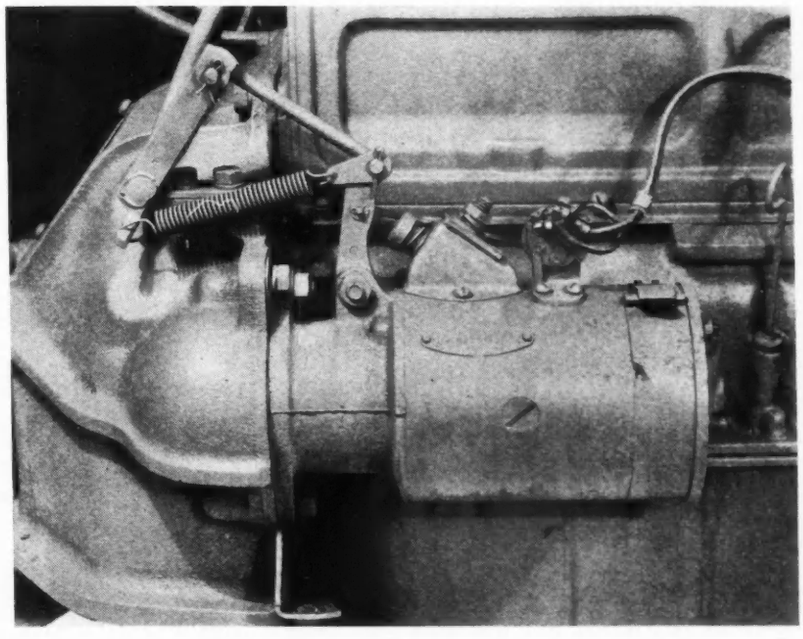
Considerable thought has been devoted to transmission problems. One object is to reduce the amount of manual shifting required—another to obtain the advantages of the overdrive without a separate overdrive unit. A vacuum gearshift is now available also on Plymouth cars. In all of the lines of the Chrysler Corporation the intermediate gear ratio in the transmission has been increased. This will increase acceleration in second gear and make it unnecessary to use first gear in starting the car under most ordinary conditions.

Chrysler Four-Speed Transmission

Chrysler Corporation also has developed, and offers as an option on certain lines, a four-speed transmission combined with a hydraulic coupling and a low-ratio rear axle. This evidently is an improvement on the former assembly comprising a hydraulic coupling, friction clutch, three-speed transmission, and automatic overdrive unit. The same as that combination, it keeps down engine revolutions per mile and increases engine smoothness and fuel economy; and apparently it will require less hand shifting than the former combination with which three of the four ratios were obtained by means of the shift lever. The new transmission has two speed ranges of two speeds each. Only the change from one range to the other is made by hand, the shift from one to the other gear in each range occurring automatically when the accelerator pedal is pressed down hard or the foot removed from it. The transmission incorporates a roller clutch, which renders the car free-wheeling in first and third speeds. Engine starting by towing or pushing, therefore, can be effected only with the transmission in second or fourth speed, and a manual device is provided which locks the transmission in one or the other of these speeds, depending on the position of the shift lever.

Engineers have been working on the problem of automatic shift for geared transmissions for more than 15 years, but up to a few years ago little success was attained, if success is measured by the extent to which such automatic-shifting transmissions had come into use. It seems that two other developments were prerequisites to the success of the automatic-shifting transmission. One of these is the gear synchronizer, which has now been available for about a decade, and which obviates clashing of gears; the other is the





(Above, right) Circuit diagram of connections for reversing switch in primary circuit of Chevrolet ignition system.

(Right) Close-up of starting motor on Chevrolet engine, showing the ignition current reversing switch installation.

hydraulic coupling, which prevents shocks (excessive accelerations and decelerations) when a change from one gear to another occurs automatically. If the transmission is of the planetary type the synchronizing device is not needed, because in that case engagement is brought about by a frictional element instead of by a positive clutch, but the hydraulic coupling serves its purpose there too, smoothing the transition from one gear speed to another.

The new Nash Ambassador 600 has independent front springing of the Lancia type. In all other American cars equipped with independent front suspension the steering heads connect to the chassis frame by parallel links or wishbones, and the free ends of these links or wishbones, to which the steering heads are attached, swing in circular arcs as the springs deflect. To prevent this from altering the tread of the front wheels, the upper and lower links are made of different lengths. As the links depart from their horizontal position, thereby tending to reduce the distance between wheels, a compensatory effect is produced by the wheels assuming inclined positions, the bottom of the wheel moving away from and the top toward the chassis. In the Ambassador 600 suspension the steering knuckles slide up and down on vertical kingpins, hence spring action does not bring about a change in tread. The early Lancia car, which was the first to carry this type of independent suspension, was known for its excellent riding qualities, and its success had much to do with the gradual popularization of front independent suspension.

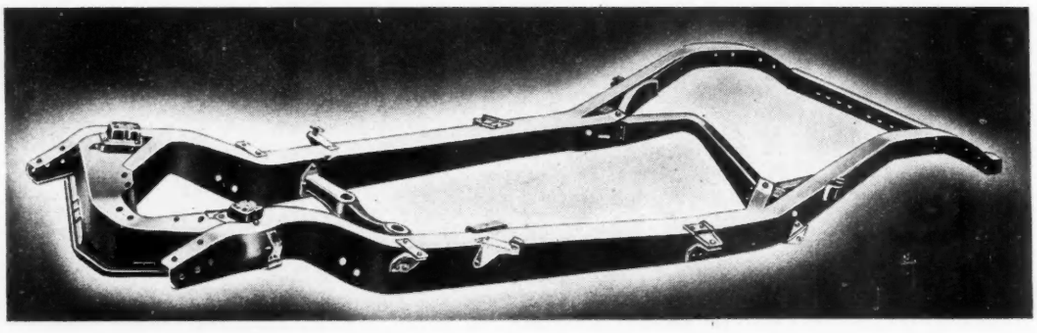
Much effort has been directed toward reducing the physical effort required to operate the various control devices, such as the shift lever, brake pedal, clutch pedal and steering wheel. The effort required to operate the steering wheel is dependent mainly on friction in the mechanism transmitting the steering effort from the steering wheel to the road wheels. There are a good many bearings in this mechanism, and the tendency has been to replace plain bearings at which there is sliding contact, with anti-friction bearings with rolling contact. The principal source of friction often is the steering gear itself, by which the angular motion of the steering wheel is geared down to the slower angular motion of the steering arm. The original worm-and-sector and screw-and-nut mechanisms have long been replaced by others in which the contact areas are greatly reduced—in a well-lubricated mechanism the friction depends on the area of the frictional surfaces and not on the pressure between them—or in which rolling motion is substituted for sliding motion. General Motors has developed a steering gear in which motion is transmitted from a worm to a wheel sector through a series of recirculating balls. This type of gear, which was first used on one Cadillac model, is gradually finding its way into more G.M. lines.

Two devices tending to reduce the physical effort required in operating the car are being offered by Packard this year. One of these is what is known as the Electromatic clutch, which consists essentially of a pneumatic unit for disengaging the clutch, the valves of the unit being actuated electro-magnetically. The other consists of power-operated window lifts. Windows are lifted by hydraulic cylinders supplied with fluid under pressure by a gear pump driven by an electric motor. Fluid is admitted to the hydraulic cylinders by solenoid-operated valves controlled by conveniently located switches. Windows are closed by withdrawing oil from the cylinder, the closing motion being assisted by a spring in the cylinder. The Electromatic clutch is optional equipment on all of the Packard lines, while the power window lifter is standard equipment on the Super Eight. The window lifter is fitted also on the Lincoln Custom and on one or two other models.

A departure in sheet-metal work which will appeal to many motorists has been made by the Ford Motor Company, which now equips its Ford and Mercury cars with front fenders built in sections. When an injury is sustained by a fender affecting one section only, it is not necessary to replace the whole fender. This will reduce the cost of repairs to the sheet-metal work and probably will have the effect of reducing the number of cars running around with crumbled front fenders.

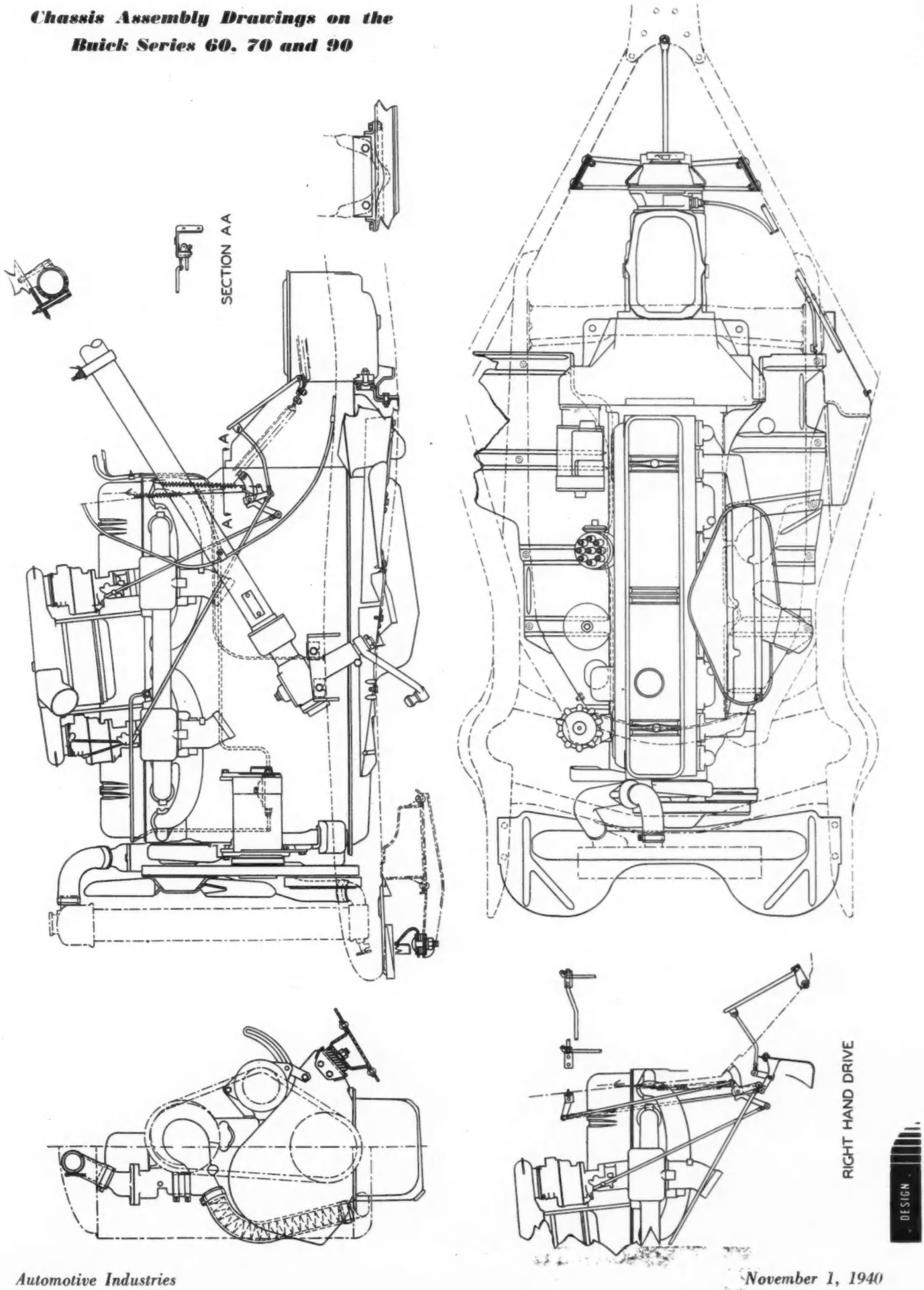
Additional manufacturers this year are offering direction signals—but usually as extra equipment. Another practice that is gaining is that of making the rear window of a sheet of curved glass.

Considerable emphasis is laid on safety features, although most of those adopted are already familiar. One maker so arranges inside door handles that they point down when the door is closed, which is intended to prevent accidental opening by passengers leaning against the handle. A new safety feature is the Safety-Rim wheel, which will be carried on Chrysler Corporation lines this year. The rim is of such shape—with a slight ridge along the inner edge of the surface supporting the bead—that the tire cannot come off when deflated, which undoubtedly reduces the chance of the driver losing control of the car in the event of a blow-out.

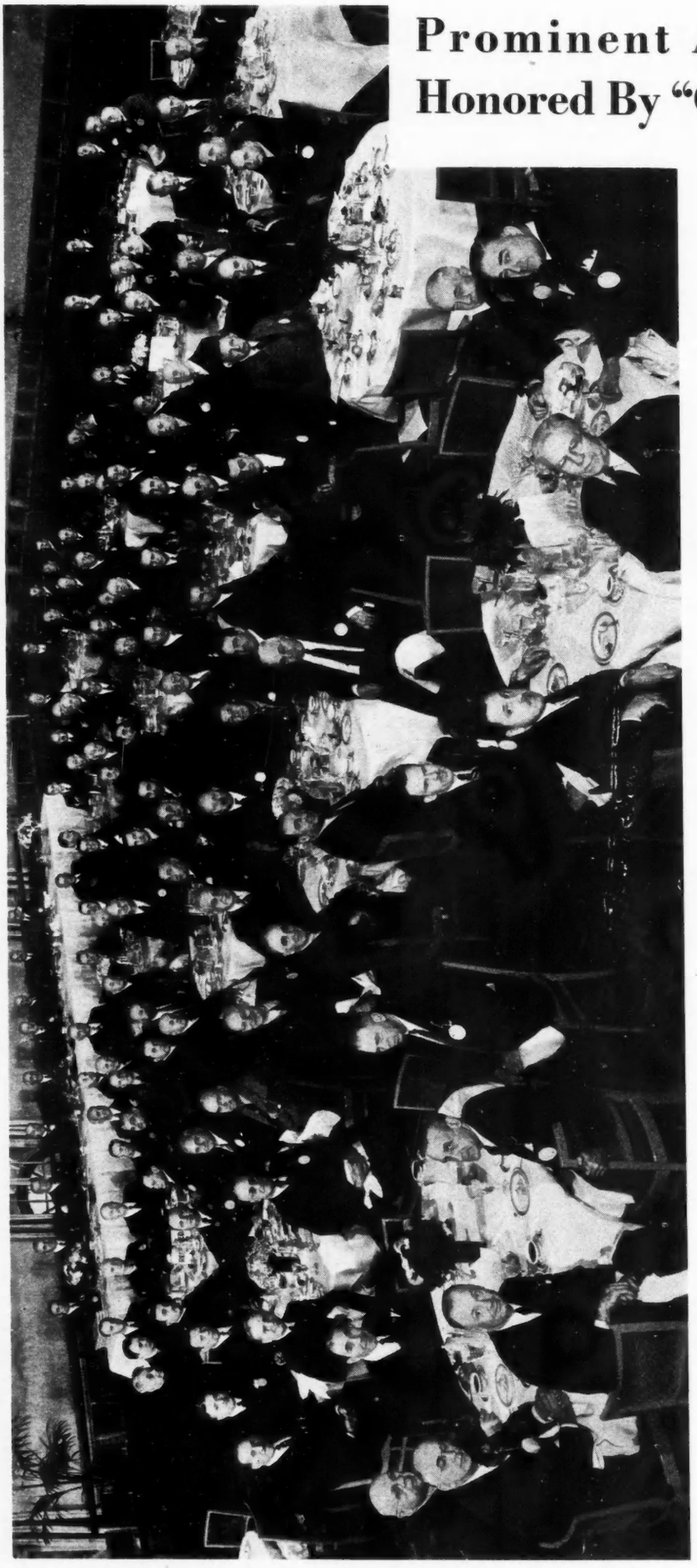


An entirely new double channel box type frame has been designed for the 1941 Chryslers. It will be seen that the X-member has been eliminated and that the box-section side rails are rigidly braced to cross members.

Chassis Assembly Drawings on the Buick Series 60, 70 and 90



Prominent Automobile Men Honored By "Old Timers" Group



MORE than 200 men who have been identified in some sphere of the automobile world for a quarter of a century or more honored five outstanding pioneers upon the occasion of the second annual luncheon of the Automobile Old Timers, held on Oct. 16 in the Grand Ballroom of the Hotel Roosevelt during National Automobile Show week.

Scores of those who made their mark in the motor car world long before 1900, among them Ransom E. Olds, Lansing, Mich.; Walter C. Baker, Cleveland, Ohio; Charles B. King, Larchmont, N. Y.; Julian Chase, directing editor of AUTOMOTIVE INDUSTRIES, and Charles S. Henshaw, Boston, Mass., were presented with citations because of their significant contributions to the development of the automobile.

The luncheon was followed by the annual meeting of the organization and presided over by William H. Hotchkiss, a past president of the American Automobile Association and former New York State Superintendent of Insurance.

Brief addresses made by Dave Hennen Morris, Honorary President of the Old Timers and former United States Ambassador to Belgium, and Alfred Reeves, advisory vice-president of the Automobile Manufacturers Association and manager of the National Show.

The presentations of the citations were made by Arthur Lee Newton, Chairman of the Committee on Research and Awards, which was composed of David M. Goodrich, John F. Plummer, Ralph Bates Dort and Leslie Peat. Another interesting event at this year's luncheon was the special recognition of all members who were associated with automobiling prior to 1900. Among the members in the Metropolitan area to be so recognized were: (1896) D. C. Fenner; (1897) William K. Vanderbilt, O. C. Duryea, R. M. Owen; (1898) Dave Hennen Morris, David M. Goodrich, Joseph W. Jones, George Conrad Diehl, Major Augustus Post, Sidney B. Bowman, Frank W. Roche, Robert P. Breese; (1899) Arthur Lee Newton, J. F. Winchester, Christopher M. Lowther. Among the out-of-town members included in the recognition were: (1895) Henry Cave, Hartford, Conn.; (1896) Truman H. Newberry, Detroit, Mich.; A. P. Warner, Beloit, Wis.; John J. Lavin, Glen Falls, N. Y.; (1897) C. W. Kelsey, Troy, N. Y.; A. S. Krotz, Ashton, Ill.; Wallace H. Owen, Rockville Center, N. Y.; Joseph A. Mechaley, Stamford, Conn.; (1898) Charles Henry Davis, Bass River, Cape Cod, Mass.; R. J. Nightingale, Cleveland, Ohio; Joseph H. McDuffee, Toledo, Ohio; E. P. Chalfant, Detroit, Mich.; P. F. Minnock, Boston, Mass.; F. T. Sholes, Geneva, N. Y.; R. W. Whipple, Binghamton, N. Y.; (1899) C. A. Musselman, Philadelphia, Pa.; James Lehan, Stoughton, Mass.; Percy Owen, Grand Rapids, Mich.; William G. Bryant, Detroit, Mich.; F. A. Hinchcliffe, Boston, Mass.; Chester S. Ricker, Detroit, Mich.; Howard B. Limric, Boston, Mass.; A. J. Paige, M. E., Detroit, Mich.; Thomas H. Galey, Owensboro, Ky., and R. J. Schmunk, Cleveland, Ohio.

The committee in charge of the luncheon comprised George Conrad Diehl, Chairman; Arthur Lee Newton, David Beecroft, George H. Townsend, and Sylvanus B. Nye.

A.S.T.M. Standards on Petroleum Products

SIXTY-FIVE standardized methods of testing, ten specifications, and two lists of definitions of terms comprise the latest (October, 1940) edition of the compilation of A.S.T.M. Standards on Petroleum Products and Lubricants. The latest report of the Society's Committee D-2 on Petroleum Products and Lubricants is included. It gives changes made in some 18 standards and also contains three proposed new methods, published for information and comment only, and covering tests for neutralization number, aniline point, and ignition quality (Diesel fuels). Among new standards included for the first time are a test for the dropping point of lubricating grease and a method of calculating the viscosity index. Copies of the publication can be obtained from the American Society for Testing Materials, 260 South Broad Street, Philadelphia, at $2 each.

Chromium-Plating Aluminum Castings

ACCORDING to a pamphlet recently published by an organization of the British aluminum industries, although chromium may be deposited directly on to aluminum, more satisfactory results are, in general, obtained by the deposition of an undercoating of buffed nickel. A nickel electroplating bath which has given good results contains 45 oz. of nickel sulphate, 2.28 oz. of nickel chloride, and 4 oz. of boric acid per Imperial gallon. To overcome a tendency to pitting, intermittent additions of hydrogen peroxide (0.053 oz. per Imperial gallon of 30 per cent peroxide) are made to the bath during the operation, but excess should be avoided as it has an embrittling effect on the deposit. The bath is used at a temperature of 140 to 150 deg. Fahr., with a current density of 30 amperes per sq. ft., the *p*H of the bath being maintained at between 2.0 and 2.5. A satisfactory mat deposit of nickel is obtained, which may readily be buffed to a high finish for chromium and other deposits.

Ford Announces 1941 Commercial Line

FORD MOTOR COMPANY during 1941 will continue its various lines of commercial vehicles, viz., the commercial unit of 112-in. wheelbase, conventional (or regular) ¾-ton and 1-ton trucks, and heavy-duty regular and COE models. An important change this year is that a four-cylinder 30-hp. engine—the Ford "Economy" engine—is offered as an option on the light commercial unit. The 60 hp. V-8 engine has been abandoned. Standard equipment of regular and COE truck models is the 85-hp. V-8 engine, but corresponding models with the 95-hp. V-8 engine are available.

A two-speed axle, installed at the factory, is optional equipment on regular and COE models. A four-speed transmission is optional on the commercial units when ordered with the four-cylinder engine.

Styling of the regular truck models has been modified and front ends of the COE jobs have been changed to resemble the regular models. Front-end styling of commercial units now is similar to that of the heavy-duty line, and the styling of the sedan delivery job has been similarly changed.

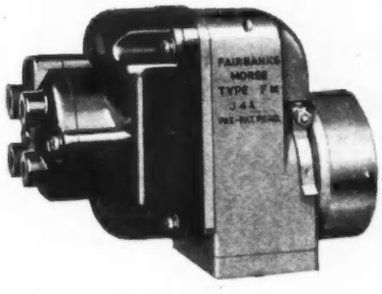
The new 30-hp. engine has a bore of 3 3/16 in., a stroke of 3¾ in. (119.7 cu. in. displacement) and is rated 30 hp. at 2300 r.p.m. It develops its maximum torque of 84 lb.-ft. at 1000 r.p.m. Several improvements have been made in the 85-V engine. The camshaft gear, bolted to the camshaft flange, is now made of aluminum alloy. That section of the valve stem which operates in the guide is now nitrided to increase its life, and the vacuum connection is now made to the main manifold riser, which is said to give a steadier source of power for the operation of windshield wipers and accessories.

In the heavy-duty models 12-leaf instead of 10-leaf rear springs are now employed and are combined with optional five-leaf helper springs installed at the factory. Frame side-rail reinforcements are installed at the factory on order; they extend from the rear of the front springs to the front of the rear springs and are a tight fit in the side rails.

Fairbanks-Morse Type FM-J Magneto

A NEW series of magnetos, designated as the Type FM-J, has been announced by the Magneto Division of Fairbanks, Morse & Company. These magnetos are available in one-, two-, and four-cylinder units, and a large variety of mountings permit application to many different engines.

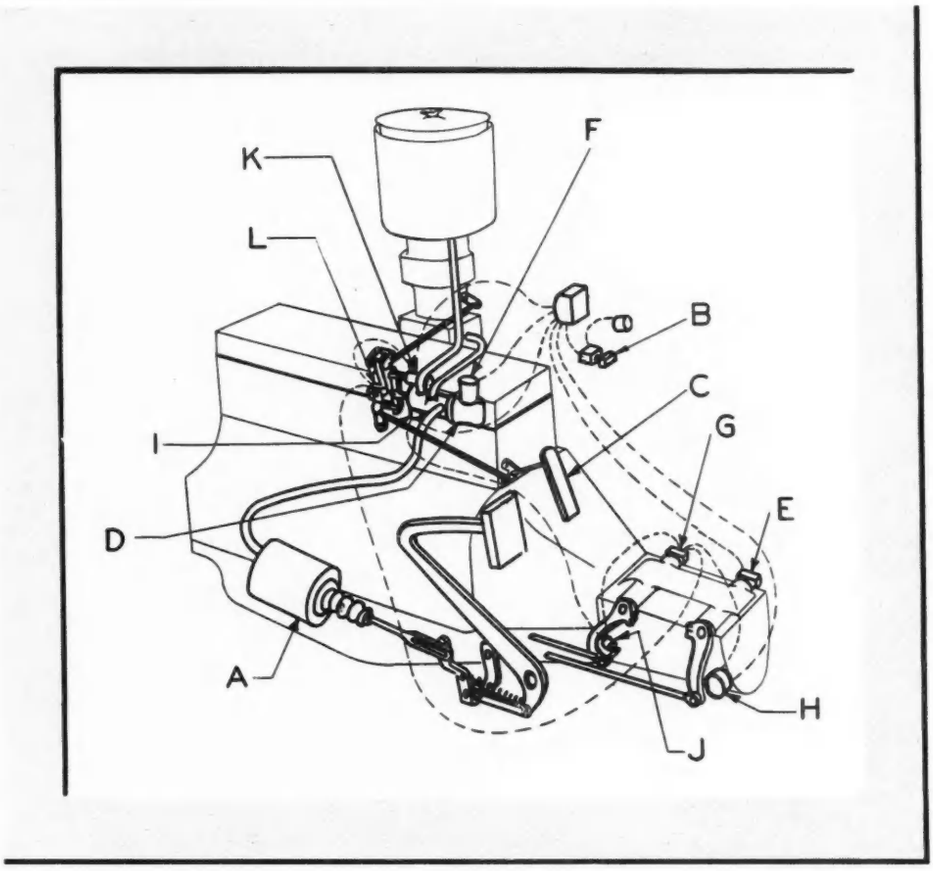
Type FM-J magnetos have a die-cast rotor with magnets of Alnico steel. The great strength of Alnico magnets has permitted a considerable reduction in the size of the unit. It is claimed for these new magnetos that they are simple in design, sturdy, and dependable, and that field adjustments are easily and quickly made. All magneto units are sealed in dust- and moisture-proof housings and permanently lubricated. The distributor of the Type FM-J4 operates in a separate compartment through which there is a constant circulation of air.



Fairbanks-Morse Type FM-J4 magneto

Wide adaptability of application is secured by means of demountable flange and base plates. Both standard and special flanges are available, as well as standard SAE and special design base plates. The basic magneto unit furnished is suitable for 35 mm. shaft height base mounting without adapter plates. Impulse couplings and drive members which cover a large number of applications are also available, making the complete Type FM-J magnetos suitable for both original and replacement applications.

Electromatic Clutch is a



PACKARD is offering as special equipment on all 1941 cars an "Electromatic" clutch which is automatic in action and makes use of the clutch pedal unnecessary under normal driving conditions. The clutch pedal is retained, however, and may be used by the driver when he wants to start the engine in cold weather or to descend a steep hill in second gear.

Referring to the accompanying drawing, the clutch is disengaged by a vacuum cylinder *A*, which communicates with the inlet-manifold through a valve. Its piston is connected to the clutch-disengaging mechanism in such a way that there is no movement of the pedal during automatic operation of the clutch.

By means of a solenoid-operated control valve in the vacuum line, the driver can make the unit operative or inoperative at will, by making use of a switch *B* on the instrument board. When the accelerator *C* is released, the clutch disengages, and when the pedal is depressed, it engages. To insure smooth and accurately timed clutch engagement under all conditions of car speed, throttle opening and engine load, a clutch-control operating valve *D* is provided to regulate the action of the master cylinder *A*.

In an ordinary gear shift the sequence of operations is as follows:

With the accelerator pedal released, the gear-shift lever is moved into the first-speed position, which causes the first-and-reverse switch *E* to energize solenoid *F*. Movement of the core of this solenoid compresses a diaphragm spring in the clutch-control operating valve to a predetermined point. With this adjustment, as the accelerator pedal is depressed, the vacuum in the master cylinder is reduced from its maximum to an amount just sufficient to balance the clutch-spring load at the initial engaging point. This insures a soft, smooth clutch engagement in low or reverse gear, when parking or moving off from a standing start.

After the car has been accelerated in low gear, the accelerator pedal is released and the shift into second gear is made. This breaks the circuit at the first-and-reverse switch *E*, which de-energizes solenoid *F* and restores the diaphragm spring to its original adjustment. This adjustment provides a more rapid rate of clutch engagement for second and high gear, in accordance with car speeds.

When the accelerator pedal is again released and the shift made into high gear, a governor switch *H* prevents clutch release above 12 m.p.h., except when this switch is "overruled" by the direct-drive switch *J*. This makes it possible to use the engine as a brake when decelerating, and prevents free-wheeling in high gear until a low car speed has been reached. When the accelerator pedal is released, governor switch *H* keeps the solenoid *I* de-energized at car speeds in excess of

Packard Option

12 m.p.h. This cuts off the master cylinder from manifold vacuum, and prevents the clutch from automatically releasing until the car speed drops below 12 m.p.h.

If a shift from high to second gear is desired at a car speed in excess of 12 m.p.h., clutch release is accomplished by switch *J*, which is operated by the first portion of the gear-shift-lever movement, and "overrules" the governor.

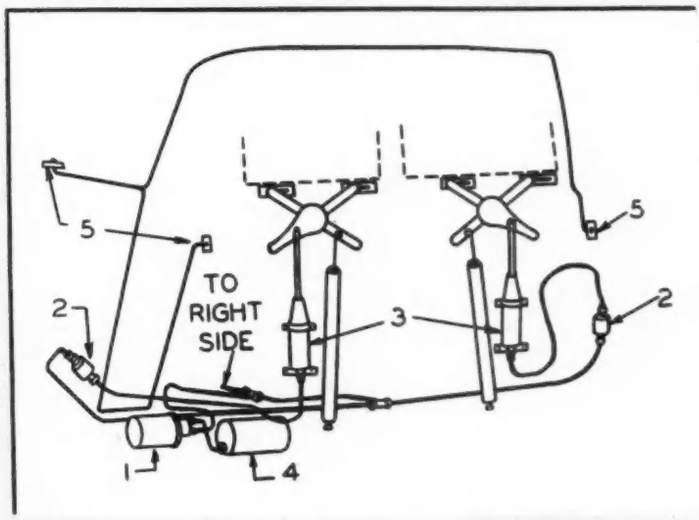
When the accelerator is depressed after shifting from high to second, a soft clutch engagement is insured by energizing second-speed solenoid *K* through switch *G* and accelerator switch *L*. Energizing this latter solenoid opens the throttle sufficiently ahead of clutch engagement to equalize the speeds of the driving and driven members at the time of engagement, thus eliminating any tendency for the car to "lurch" when engagement takes place.

Window Regulator System

THE ILLUSTRATION herewith is a diagrammatic view of the Hydro-electric window regulator system on Packard Senior bodies, which is furnished by Dura Company of Toledo, Ohio.

In the illustration *1* is the motor and pump unit, which consists of a 6-volt, 4-in. reversible motor with built-in direct-connected gear pump which circulates hydraulic brake fluid under pressure through the operating mechanism in each door through metal tubes and rubber hose. The motor is a standard starter motor of the four-pole type but with special field windings. Two of the field coils are energized when the motor raises the window, while the other two are energized when the window is being lowered and the motor turns in the opposite direction. In the latter case the load on the motor is much less and a different field winding is used to give about the same speed in lowering as in raising the window. The pump is a conventional gear pump with a die-cast housing which also forms one end frame of the motor. Gears are cut with helical teeth to make them silent in operation. A spring-loaded relief valve is fitted in the pump cover and by-passes the fluid when the window reaches its upper limit or comes up against an obstruction.

There is a solenoid-operated valve *2* in each door, in the line to the window. These valves are normally closed and can be opened by the operating switch of each door. Within each door and in the partition between front and rear compartments of limousines there is a piston and cylinder assembly *3* which is connected to the conventional window-regulator mechanism to raise and lower the window. The down stroke of the piston in the cylinder is produced by withdrawing oil from the cylinder and is assisted by a spring. A fluid reservoir *4* is connected to one pump opening to hold the fluid withdrawn from the cylinders when the windows are in the lowered position. Double-acting control switches *5* are provided for each window, the rear-window switches being located above the arm rests, the front-window switches on the front doors. In standard sedans there are two additional switches for the rear windows at the top of the instrument panel, so the driver can raise these windows.



White Extends Line of "Super P

EXTENSION of the Super Power engine design to a complete, "balanced" line of motor trucks in conventional and cab-over-engine types is announced by White Motor Company. Straight trucks, tractors, and six-wheelers are available in all of the various models. A number of new mechanical features have been introduced, and the principles of basic standardization and interchangeability of parts have been carried further than ever before in White practice.

Engines of the Super Power type have been used by White in two heavy-duty models for some time, and some of them are said to have covered more than 200,000 miles each. The same design principles have now been applied to engines for the lighter models. Four basic Super Power engines are now being produced to take care of the complete range of models in this group. Principal specifications are as follows:

Model 100A—six cylinder, 3 7/16-in. bore, 4½-in. stroke, 250-cu. in. displacement, 90 hp., 185 lb.-ft. maximum torque, with a compression ratio of 6.75.

Model 110A—six cylinder, 3 9/16-in. bore, 4½-in. stroke, 270-cu. in. displacement, 100 hp., 200 lb.-ft. maximum torque, with a compression ratio of 6.5.

Model 120A—six cylinder, 3⅞-in. bore, 4½-in. stroke, 318-cu. in. displacement, 110 hp., 250 lb.-ft. maximum torque, with a compression ratio of 6.4.

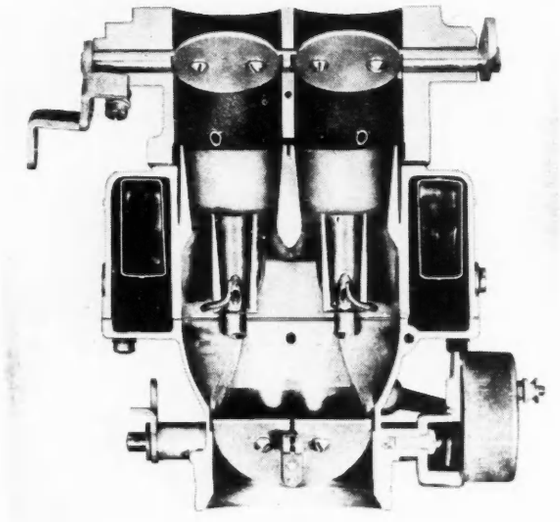
Model 140A—six cylinder, 3⅞-in. bore, 5⅛-in. stroke, 362-cu. in. displacement, 125 hp. 285 lb.-ft. maximum torque, with a compression ratio of 6.28.

All models have a governed engine speed of 2600 r.p.m. Cylinder blocks and crankcases are made of chrome-nickel alloy, with cylinder heads of cast iron.

The line of chassis models includes the WA-14 with a gross rating of 14,000 lb., the WA-18 with a gross rating of 16,000 lb., the WA-20 with a gross rating of 18,000 lb., the WA-22 with a gross rating of 21,000 lb., the WA-26 with a gross rating of 24,000 lb., and the WA-34 with a gross rating of 32,000 lb. All of these chassis models are available in a choice of seven wheelbases running from 136 in. to 226 in. Each conventional truck model has its counterpart in a "100" series of cab-over-engine model.

Mechanical features of the new Super Power line include a six-port intake manifold of special design, copper-lead, indium-treated main and connecting-rod bearings, Stellite-faced exhaust valves and seats in all models, sodium-cooled valves in the two large engines, Wilcox-Rich hydraulic valve lifters, a full by-pass thermostatic cooling system, aluminum pistons, Handy governor, five-speed transmissions and oil-temperature control.

All conventional chassis models are equipped with



A dual carburetor is used for the six-cylinder engines, each unit supplying alternate cylinders in the firing order

The double-reduction rear axle which is standard on heavy-duty models and optional at additional cost on lighter models.

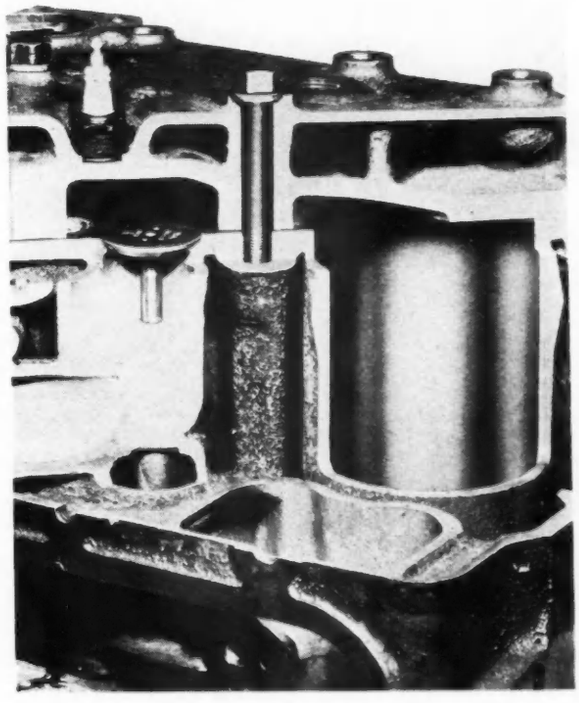
Powered" Trucks

White C.O.E. truck chassis with Super Power engine

Stromberg dual-downdraft balanced carburetors with manual choke, while all cab-over-engine models have updraft carburetors. The fuel pump on all engines is placed on the side opposite the manifold location, to reduce the chance of vapor lock. As optional equipment, White offers a patented air-heater for preheating the carburetor inlet air. In winter time preheating of carburetor air has the advantage that it improves vaporization and combustion of the fuel, while in summer time, although it reduces the maximum engine power, if maximum performance is not needed, it is said to offer the advantage of lowering the fuel consumption. The system, which embodies a small radiator, is designed mainly for use in winter and obviates the need for radiator shutters.

The cooling system is said to be of such design as to insure proper water flow at all points and uniform temperature conditions. A special by-pass system is incorporated in the engine which during the warm-up period in cold weather operates contrary to the usual method of restricting the flow through a small orifice. The main body of water within the engine proper is continually recirculated, with only a relatively small amount escaping to the radiator, which gradually brings it up to the same temperature as the engine proper.

The oil-temperature-control unit with its miniature radiator section is an integral part of the central system. It heats the oil to the proper operating temperature in cold weather, and it reduces the oil temperature



To prevent mechanical distortion of cylinder bores, blocks are cast with pillars into which the cylinder head bolts are screwed

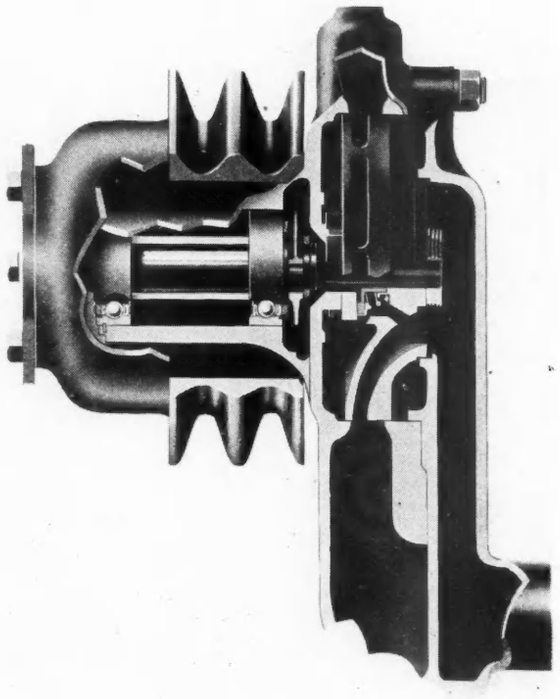
when the engine is being worked hard in hot weather, thus stabilizing lubricating conditions.

Five-speed transmissions with direct drive in fourth or fifth are offered as standard equipment on the large models, and as options with the smaller units. Unless other equipment is requested, the latter come with four-speed transmissions. The five speed units are said to offer marked advantages where steep grades must be negotiated and long runs made. All White transmissions have carburized gears of alloy steel, and their shafts are very rugged.

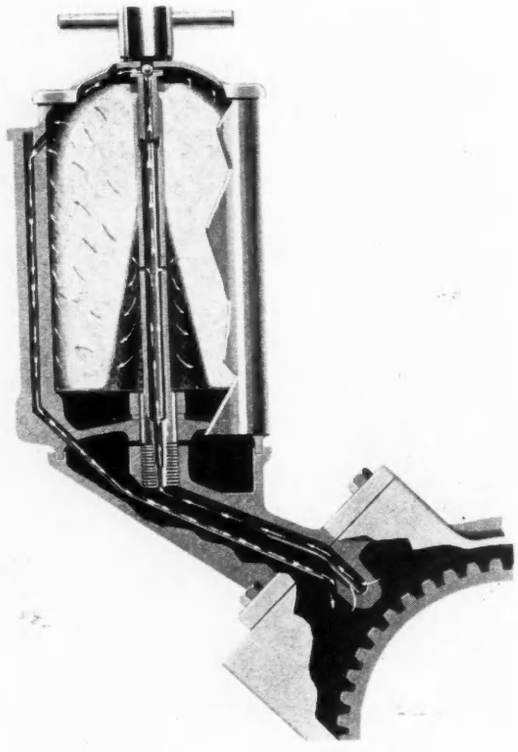
Full-floating double-reduction rear axles are standard on the WA-26 and WA-34 series trucks, and optional on all other models. The latter, unless otherwise specified, come with full-floating single-reduction axles as standard. Two-speed axles are offered as optional equipment on both the conventional and the cab-over-engine models. They are of the double-reduction type having two sets of wide-faced helical second-reduction gears providing two different ratios. The two helical pinions float on the countershaft and are engaged selectively by a sliding clutch.

On all models of the White Super Power line, with the exception of the WA-34, hydraulic brakes are standard equipment. Westinghouse air brakes are optional at extra cost. Air brakes are standard on the WA-34. Dual vacuum-power cylinders are provided on some of the hydraulic-brake jobs.

Many basic parts are interchangeable between all models from the smallest to the largest, a feature that is expected to appeal to fleet owners because of its effects in lowering maintenance costs and simplifying replacement-parts stocking problems. Parts which are interchangeable on all models include fuel pumps, water pumps, fans, generators, fan belts, pulleys, thermostats, oil pumps, oil pans, oil filters, camshaft and timing gears, crankshaft main bearings, spark plugs, batteries, air cleaners, valve springs, inlet and exhaust manifolds of either updraft or downdraft lines, etc. In addition, there are many items which are interchangeable between some of the models. For instance, the inlet valves, connecting rod bearings, crankshafts and fuel tanks on three out of four engines are the same. Starting motors are the same on the 100A and the 110A, and also on the 120A and the 140A.



Cut-away view of the self-sealing water pump and drive pulley

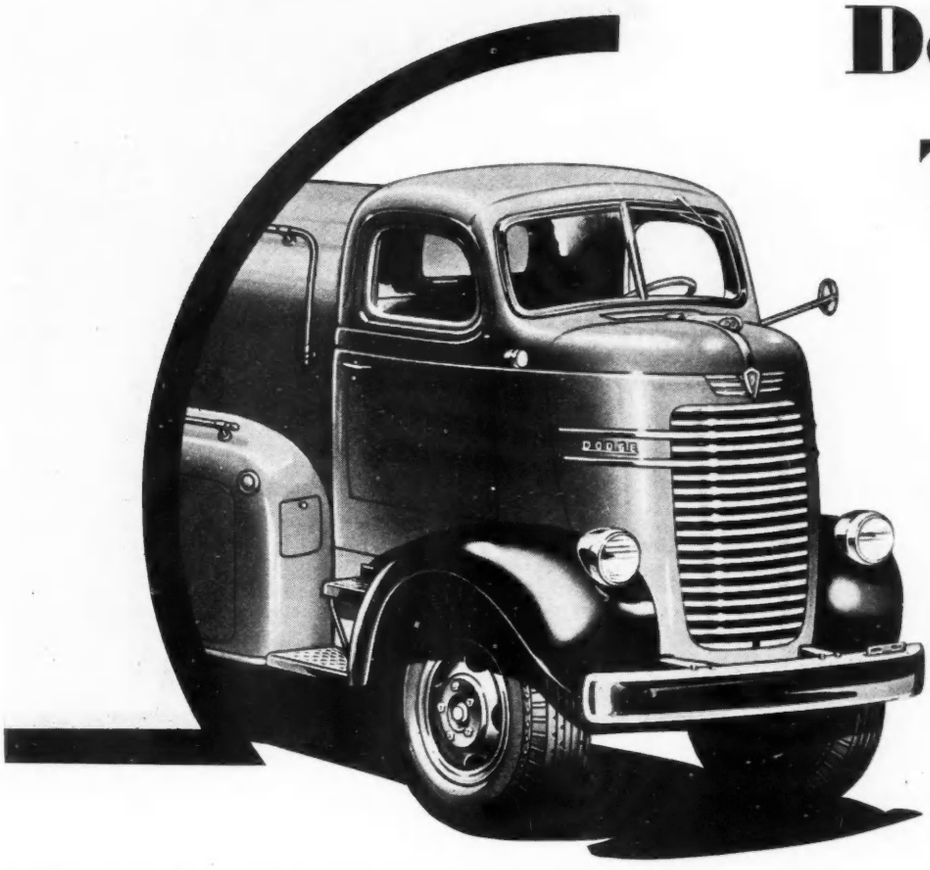


The oil filter is mounted directly on the engine and no connecting tubes are used

NEARLY all of the motor buses in service in Italy now are operated on what are known as succession motor fuels of national origin. Statistics are available only up to the beginning of 1939, at which time of the total number of 4481 buses in service, 771 operated on methane gas (produced from sewage sludge), 562 on producer gas, and 282 on methyl alcohol, while 390 were electrically propelled. The greater number of buses, however, viz., 2282, were operated on "national naphtha," which presumably means petroleum distillates from Albanian crudes. Thus 4287 of the total of 4481 buses in service a little over a year ago, consumed fuels of national origin.

AN ITALIAN interministerial committee has looked into the problem of synthetic rubber production and has decided upon the erection of a factory for the industrial production of such rubber. The plant will be operated by the Iri-Pirelli group and will be located in the vicinity of Ferrara close to a large alcohol distillery.

Dodge Trucks for '41

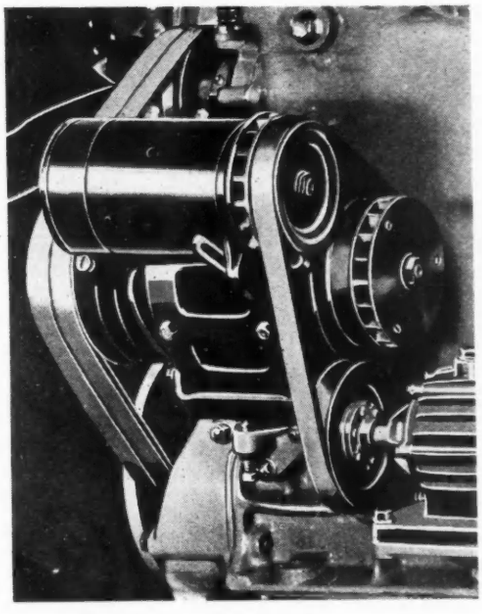


Dodge 2-ton cab over engine truck with special body.

DODGE TRUCKS for 1941 are being offered in 112 standard chassis and body models (16 more than last year), in 18 different wheelbase lengths and six capacity ratings ranging from ½-ton commercial units to heavy-duty gasoline-engine and Diesel-powered freight haulers. Eye appeal of the trucks has been further increased. Sealed-beam headlamps are mounted in pockets formed in the front fenders, and new-style parking lights are mounted on the cowl. The new ½-, ¾-, and 1-ton trucks are available in a variety of two-tone color combinations at no extra cost.

New equipment this year includes an oil-bath air cleaner, a metal-edge fuel filter at the carburetor, and a floating-type oil-pump screen. The six-cylinder engines remain substantially unchanged. The ½-ton, ¾-ton, and 1-ton models are equipped with a new syncro-shift transmission which facilitates gear shifting. On these models the engine power has been increased somewhat by increasing the valve lift. All 1-ton models will be equipped with a new full-floating rear axle with one-piece housing. Sixteen inch, six-stud wheels are standard equipment on this model, but 20-in. wheels are available at extra cost. One-ton models with stake, platform, panel and pick-up bodies can now be had with dual rear-wheel equipment. With this equipment the stake and platform bodies have an additional width of 6 in.

The 1941 line includes a 1½-ton truck measuring 60 in. between the cab and the center of the rear axle. This model has a wheelbase of 135 5/16 in. and replaces the former 1½-ton model with 133-in. wheelbase. An additional axle ratio of 6.833 is now available on this truck.



Mounting and drive of the two generators and vacuum pumps carried on Dodge Diesel-powered trucks.

New-style tires with flatter and thicker treads are standard equipment on the 1½-ton, 2-ton, and heavy-duty models (both gas-powered and Diesel). On 1½-ton and 2-ton models studs are used instead of screws to fasten the rear-axle drive-shaft flange to the hub. All heavy-duty models have a new 10-in. booster brake cylinder which reduces the foot pressure re-

NEW TRUCKS

quired to apply the brakes, and also a larger (19-in.) steering wheel.

Improvements in the cab include the provision of double-cone coil springs with helical cross-tie lacings, heavier construction of cross braces in seat cushions, and thicker padding between springs and upholstery material. Seats are now upholstered in 30-ounce rubber-coated sateen of two-tone brown finished in Morocco grain. The interior trim is in brown to match. Diesel cabs are upholstered in brown leather.

Cab-door latches have been strengthened. Panel and canopy bodies have a new type of bucket seat which is wider, has a higher steel back, and is heavily padded and spring-cushioned for greater driver comfort. This seat tilts and can be adjusted backward and forward.

Panel bodies have better sealing against dust and water, and pick-up and canopy bodies have improved tail-gate chain brackets. Stake and platform bodies have been strengthened at various points, and wear plates have been added between the stake and the front and rear cross sills.

Diesel trucks are now equipped with an auxiliary 6-volt generator which furnishes current for lights, instruments and dual horns. This auxiliary generator is said to come in particularly handy when it is required to light trailer equipment. The primary generator and starting motor operate at 24 volts. In Diesel models there is a dome light in the cab over the rear window. The group of instruments on the panel is also lighted. A tachometer is standard equipment. Wheel-base lengths are as follows:

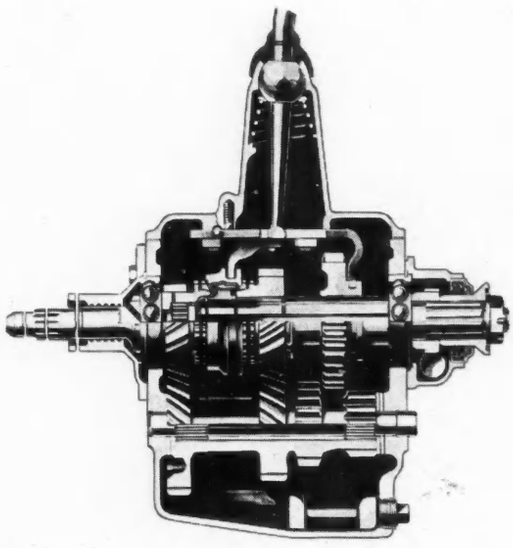
One-half ton—116 in.

Three-quarter ton—120 in.

One-ton — 120 and 133 in.

One-and-one-half-ton regular models — 126½, 135 5/16, 160 and 190 in.

One-and-one-half-ton c.o.e. models — 105, 129, and 159 in.



Sectional view of new synchro-shift transmission of ½-ton, ¾-ton and 1-ton Dodge trucks.

Two-ton regular models—136, 148, 160, 178 and 220 in.

Two-ton c.o.e. models—105, 129 and 159 in.

Heavy-duty trucks—152, 170, 188 and 205 in.

Six different engines power the 1941 line of Dodge trucks. There are 17 different rear-axle gear ratios, 23 different frames, four clutches, six brake combinations, ten basic spring combinations and eight rear axles. With this large variety of basic units to choose from, Dodge should be able to meet the requirements of any particular transportation problem with specific solutions.

A COPY has been received of a "Report of the Committee on the Emergency Conversion of Motor Vehicles to Producer Gas," published by His Majesty's Stationery Office, London, England, at 9 d. The report contains illustrations of a design for a producer developed by the Committee and of a trailer unit on which the producer and auxiliary equipment can be carried.

THERE are now 1671 trolley buses in service in London, operating on routes—256 miles long—formerly served by trolley cars on rails, and it is announced that no further conversions in services will be made while the war lasts. There are only two trolley-car lines (tram lines) left on the north side of the Thames, on the Thames Embankment and in the Kingsway Subway.

IN A paper on Progress in Petroleum, presented before the American Institute of Chemists at its annual meeting in Atlantic City, Dr. Gustav Egloff of Universal Oil Products Company Research Laboratories, Chicago, said there is evidence to contradict the view that crude oil is an irreplaceable asset. He believes that petroleum is being formed in the earth at a greater rate than it is being consumed. One fact that supports this belief is that the oceans, lakes and rivers of today abound with fish and mollusks closely resembling those found in many petroleum-bearing formations. Microscopic creatures, including diatoms, are present which are identical in body structure with fossils found in the Monterey shale and other oil-producing structures. Such diatoms, scooped alive from the ocean today, yield about 2 per cent of oil by either extraction, although they contain about 16 per cent organic material. It is possible that this oil yield may be greatly increased under the temperature, time and pressure conditions prevailing in the earth, and also that some substances, such as the silica body structure of the microscopic corpses in the earth, exert a catalytic influence which accelerates oil formation.

OWING to the European war the Institution of Automobile Engineers (Great Britain) dropped its regular research program and decided to devote its research efforts for the time being to problems arising out of war conditions. Three new projects have been started upon, viz., Fuel Economy, The Power Deficiency with Gas Producer Operation, and Creosote as a Fuel for Compression-Ignition Engines.

Industry Pledges Support To U. S. Aircraft Program

Automotive Leaders Discuss Plan To Produce $500,000,000 In Parts During Next 18 Months

Offering their fullest facilities to expedite the production of military aircraft, especially bombing planes, leaders of the automotive industry convened in Detroit Oct. 25 to organize for the production of $500,000,000 in airplane parts during the next 18 months. Wm. S. Knudsen, production member of the National Defense Advisory Commission, three executives of the airplane section of the commission and five ranking army air corps officers, headed by Maj.-Gen. Geo. H. Brett, newly appointed acting chief of the U. S. army corps, met with the leaders of the automobile industry to work out preliminary plans for this phase of the defense program.

A committee was appointed, designated the Committee on Cooperation with the National Defense Advisory Commission, to work out further details. Members of this committee are: Alvan Macauley, chairman of the board, Packard Motor Car Co.; Edsel Ford, president of the Ford Motor Co.; K. T. Keller, president of the Chrysler Corp., and C. E. Wilson, acting president of G. M. Corp., representing the passenger car manufacturers. Representing the parts and equipment manufacturers will be C. C. Carlton, vice-president and secretary of the Motor Wheel Corp. with L. D. Adams, vice-president of the Associated Spring Corp. as alternate. Representatives of the motor truck makers and the motor vehicle body manufacturers were to be appointed later.

Under the committee's direction, a five-point program of cooperation will be carried out as recommended by Knudsen. It follows:

1. An inspection of the airplane plants making the types of planes involved in the automotive assignment so as to get the proper picture of the methods of manufacturing now employed.

2. A detailed study of plane parts and blueprints in cooperation with aviation manufacturers to determine what production changes may be possible, so as to transfer some of the new work from bench to machine operation.

3. A survey of automotive equipment now in place which may be available for press and die work on airplane parts.

4. A survey of plant facilities available for sub-assembly of such items as wings, ailerons, tail surfaces and rudders.

5. An investigation of the forging situation in both aluminum and steel, and study of machining facilities now available.

Maj. Gen. Brett told the motor manufacturers that his service shortly would bring to Detroit detail drawings and actual parts of the plane types manufactured in order to expedite production studies by the industry. Approximately

(*Turn to page* 511, *please*)

Purolator Expands Plant At Newark

An addition of 15,000 sq. ft. of factory space has been made to the Newark, N. J. plant of Purolator Products, Inc.

International

Guggenheim Medalist

Glenn L. Martin, president of the aircraft company that bears his name, who has been awarded the Daniel Guggenheim Medal for 1940

Nine Months' Exports and Imports

	SEPTEMBER 1939		SEPTEMBER 1940		NINE MONTHS ENDED SEPTEMBER 1939		1940	
	No.	Value	No.	Value	No.	Value	No.	Value
EXPORTS								
Automobiles, parts and accessories		$ 12,456,885		$ 15,735,474		$ 190,126,628		$ 180,478,399
PASSENGER CARS								
Passenger cars and chassis	4,374	2,778,205	2,379	1,689,678	106,244	65,068,105	65,503	40,976,664
Low price range $850 inclusive	3,843	2,244,192	2,101	1,406,642	94,910	53,104,254	58,079	33,203,165
Medium price range over $850 to $1200	455	417,350	253	237,811	9,735	9,267,303	6,419	6,099,917
$1200 to $2000	70	101,918	20	27,125	1,314	1,941,053	868	1,259,523
Over $2000	6	14,745	5	18,100	285	755,495	137	414,059
COMMERCIAL VEHICLES								
Motor trucks, buses and chassis (total)	3,310	2,501,592	3,140	4,957,223	86,252	53,813,914	73,374	61,919,473
Under one ton	439	178,019	263	164,073	12,816	5,391,657	9,582	4,393,323
One and up to 1½ tons	2,146	1,350,711	1,968	1,114,818	60,056	32,998,953	48,655	26,998,988
Over 1½ tons to 2½ tons	575	600,337	313	307,584	9,647	8,770,582	9,807	12,413,738
Over 2½ tons	150	372,525	578	3,353,322	3,154	6,126,454	5,161	17,886,184
Bus chassis			18	17,426	579	524,268	169	227,240
PARTS, ETC.								
Parts except engines and tires								
Automobile unit assemblies		2,716,944		5,375,724		29,849,805		37,184,735
Automobile parts for replacement (n.e.s.)		3,210,963		2,673,739		29,365,907		29,010,313
Other automobile accessories (n.e.s.)		404,358		492,725		3,023,195		3,771,220
Automobile service appliances		389,423		307,451		4,511,092		3,100,918
Airplanes, seaplanes and other aircraft (powered)	62	3,956,423	284	12,228,209	154	46,140,909	2,467	145,545,564
Parts of airplanes, except engines and tires (n.e.s.)		3,220,811		3,199,863		15,940,991		18,110,776
INTERNAL COMBUSTION ENGINES Stationary and Portable								
Diesel and semi-Diesel (other than automotive)	39	205,784	101	228,288	401	1,460,607	759	2,353,481
Other stationary and portable								
Not over 10 hp.	1,136	66,984	954	55,196	10,899	634,767	10,974	626,079
Over 10 hp.	200	104,599	109	89,919	1,514	958,607	1,771	2,409,157
Engines for:								
Motor trucks and buses	1,887	269,195	700	86,552	20,400	2,514,128	14,662	1,648,275
Passenger cars	620	99,325	28	3,194	19,237	1,720,896	12,113	1,091,772
Aircraft	78	372,589	441	4,311,910	1,298	9,183,705	3,337	30,910,558
Accessories and parts (carburetors)		278,263		280,063		2,160,507		3,532,938
IMPORTS								
Automobiles (dutiable)	41	38,599	27	22,718	454	334,803	468	454,459

Expect No Labor Shortage In Michigan 'Till Summer

Ford and Packard Aircraft Engine Plants, Chrysler Tank Arsenal and Continental Motors Will Require 40,000 Men

Industrial employment throughout Michigan for September showed a gain of 10.9 per cent over September, 1939, while payrolls increased 16.8 per cent for the same period. Employment in the automobile industry registered a 7.7 per cent increase over a year ago and was up 27.5 per cent over August. A total of 286,557 workers were employed in the manufacture of automobiles, tires, parts and accessories during September, with a weekly payroll of $10,821,745. Toledo automotive plants reported similar gains, with 22,038 on industrial payrolls there in mid-October for the highest point since October, 1937.

Shortages reported in Michigan plants were in such skilled occupations as architectural draftsmen, non-ferrous foundry molders, cutter and tool grinders. There also was a comparative scarcity of tool and die designers, machinists, lubrication men, upholsterers, arc welders, sheet metal workers, hammermen, machine tool operators and metal polishers. However, no serious labor shortage even of skilled workers is anticipated until at least next summer when the new Ford and Packard aircraft engine plants, the Chrysler tank arsenal and the reopened Continental Motors plant will be swinging into production on National Defense orders. Those four plants will absorb nearly 40,000 men. Ford already is making plans to meet this problem with an apprentice training program that eventually will instruct 6000 youths in airplane engine operations.

Although there is a scarcity of labor in certain skilled capacities, 218,669 applications for unemployment insurance were in the files of the Michigan Unemployment Compensation Commission as of Oct. 15, indicating a large supply of labor for Detroit and Michigan industries engaged in National Defense work. It is estimated that approximately 100,000 of the unemployed are skilled and semi-skilled workers but it also is certain that quite a number of the total are unemployable, due to physical or mental handicaps.

Strangely enough, the total applying for compensation shows an increase of 22 per cent over the number a year ago, but this can be attributed to more familiarity with the unemployment insurance set-up rather than less employment in the state. All other signs point to increased industrial activity in contrast to October, 1939.

The industrial employment index for Metropolitan Detroit as compiled by the Detroit Board of Commerce reached its highest point since July 15, 1937, when it hit 117.3 on Oct. 15. This is computed with the 1923-25 monthly average as a base. The index showed a gain of 5.7 points over Oct. 1. Industrial employment totaled 399,993 workers as of Oct. 15 in the Detroit area.

The relief load for Michigan was down to 46,000 cases in mid-October, a decline of nearly 40 per cent from last February's peak of 73,000 cases. It is the lowest relief load, except for a few months in 1937, since the state entered the relief picture. In Wayne County, there were 26,904 persons on WPA on Oct. 15 compared to 31,831 a year ago, while the total welfare cases in Detroit declined more than 30 per cent, from 23,016 to 15,655.

With its membership voting an estimated $300,000 in assessments to aid the organization of the Ford Motor Co., the UAW-CIO launched its campaign Oct. 21 when 75 organizers distributed mimeographed leaflets to workers at the Lincoln plant in Detroit. The distribution, under the direction of Michael F. Widman, Jr., Ford organizational director for the UAW, proceeded peacefully although police were on hand in case of any disorder.

Results of the referendum of UAW locals on the $1 assessment per member for the Ford drive showed 1208 votes for the assessment and 182 against it. Voting was on the basis of national convention votes awarded each local in respect to total membership. What little opposition there developed to the measure was centered in Toledo and Flint, only one Detroit vote being in the negative. Assessments are payable by Dec. 31.

The executive board of the UAW-CIO has advised its member locals that it will not tolerate stoppages of work contrary to contracts and the union constitution. The union will not intercede or support members proved guilty of participating or instigating unauthorized strikes. This is the most drastic step the board of the union has taken to curb wildcat strikes. The letter addressed to the locals was signed by Roy J. Thomas, president, and George F. Addes, secretary-treasurer.

The executive board also indorsed the policies and practices of the union's General Motors department, under the direction of Walter P. Reuther, who had been the object of attack by some factions in the UAW-CIO.

The Chrysler unemployment compensation case was delayed by the Michigan Supreme Court to give counsel for both sides additional time to file briefs.

Dr. H. A. Millis, professor emeritus of economics at the University of Chicago, has been appointed the permanent umpire under the terms of the agreement between the General Motors Corp. and the UAW-CIO.

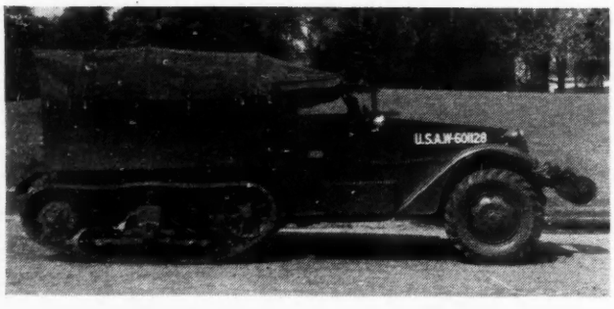
Johnny Q. Cardboard

This cardboard pattern, with dimensions representing a composite of the nation's male population, helps Ford Motor Co. designers determine clearances and interior arrangements of new model automobiles. Dimensions of the figure are: height, 5 ft. 8 in.; arm length, 32¾ in.; leg length, 32 in.; sitting height, 35¾ in.

U. S. and Britain To Confer On Aircraft Standardization

A program of aircraft standardization extending to gun calibers, parts and other phases of aircraft construction is to be worked out by joint efforts of American and British representatives. A four-man informal committee named by President Roosevelt includes Secretary of War Stimson, Secretary of Navy Knox, Defense Commissioner Knudsen and Treasury Secretary Morgenthau.

Designed so that plants now building



Scout Car

Army scout car with "half - trac." A number of these vehicles are now being built by the White Motor Co. for the U. S. War Dept.

one model of pursuit plane for the British and another for the United States will hereafter concentrate on one design, the plan will require Army and Navy experts to pass on details. Ten leading technicians from Great Britain are expected to confer with United States officials. The development was disclosed by Mr. Morgenthau who said that in changing designs Army and Navy requirements must be adhered to but that as a secondary consideration efforts will be made to conform to British desires.

Australia Builds First Fuel Plant

Australia advanced another step towards national self-sufficiency last month when it started commercial production of gasoline in a new cracking plant at Glen Davis, Sir Frederick Stewart officiating at the opening ceremonies. Present capacity of the plant is about 35,000 gal. of fuel daily, approximately 10,000,000 gal. per year. Plans are reportedly ready for extending output to 30,000,000 gal. yearly. The oil is being obtained from shale deposits claimed to be the richest in the world.

Production of Electrical Equipment Dropped In '39

Declining approximately $28,000,000, the production of the automotive electrical equipment industry in 1939 was $109,761,620 compared with $137,711,837 in 1937, according to the Bureau of the Census.

A drop of almost $8,000,000 was recorded for automotive generators for battery charging while there was a decrease of about $12,000,000 in the value of railway motors and automotive generators and motors, together with their equipment. The 1939 value of automotive generators for battery charging was $14,814,949 against $22,359,248 in 1937. Production of railway motors and automotive generators and motors, with equipment, declined to $21,911,109 from $33,589,524.

Army Test

This photograph was taken at the Holabird Motor Transport Depot during a recent U. S. Army 1000-mi. "torture" test of a pilot model Bantam truck. The 80-in. wheelbase, 40 hp. Bantam is shown here preceding a seven-ton truck down a 65-deg. grade. It is equipped with four-wheel drive and over-sized tires.

Acme

24-Hr. Day Ordered For Aircraft Plants

Instructions Sent To 17 Manufacturers; Congress Appropriates $120,000,000 To Cover Higher Costs

Stepping up production to the limit, the War Department has ordered the entire aircraft industry to go on a 24-hour day where that is possible. Because of a shortage of materials it was stated that in a few instances plants will not be able to operate on a three-shift basis. Assistant Secretary of War Robert P. Patterson said that the order was given to accelerate production of 21,000 planes for the Army. The instructions were dispatched by Maj. Gen. Henry H. Arnold, chief of the Air Corps, to 17 companies having 63 Army contracts.

To cover costs of increasing shifts working in aircraft plants, Congress appropriated $120,000,000. It was estimated that costs per plane will be increased about 20 per cent under the three-shift schedule which is expected to produce two and a half as many planes as one shift. The Federal Government pays the extra costs under "acceleration" clauses, which, Mr. Patterson said, are included in 90 per cent of the Army contracts.

Domestic production of planes now is at the rate of about 1000 monthly of which about one-half are going to Great Britain.

Mack Producing Larger Diesel

Mack Trucks, Inc., Long Island City, N. Y., is producing a new model Mack-Lanova Diesel, the END-605. Similar in design and principle to the 519 cu. in. ED engine, the new Diesel has a piston displacement of 605 cu. in. and bore and stroke of 4⅝ in. by 6 in. It operates at the same maximum speed of 2000 r.p.m. as the Mack ED and develops 144 hp. at that speed. Maximum torque at 1100 r.p.m. is 455 lb-ft.

Nine Months' Rim Inspections Up 19%

The Tire & Rim Association reports that it approved and branded 1,355,924 rims during September, a decrease of approximately 14.5 per cent as compared with September a year ago. During the first nine months of 1940 the Association approved and branded a total of 14,021,592 rims, an increase of approximately 18.8 per cent above the same period in 1939.

H. H. Timken, Sr.

H. H. Timken, Sr., chairman of the board of the Timken Roller Bearing Co., died Oct. 14 at Canton, Ohio.

Monthly Motor Vehicle Production
(U. S. and Canada)

	PASSENGER CARS		TRUCKS		TOTAL MOTOR VEHICLES	
	1940	1939	1940	1939	1940	1939
January	375,476	292,869	74,016	64,093	449,492	356,962
February	350,535	253,914	71,690	63,606	422,225	317,520
March	364,947	312,392	75,285	77,107	440,232	389,499
April	375,626	286,200	76,807	68,066	452,433	354,266
May	338,353	249,455	74,139	63,793	412,492	313,248
June	294,779	257,289	67,787	66,964	362,566	324,253
July	172,166	155,850	74,005	62,750	246,171	218,600
August	48,333	62,475	41,533	40,868	89,866	103,343
September	227,880	165,119	56,703	27,560	284,583	192,679
9 Months	2,548,095	2,035,563	611,965	534,807	3,160,060	2,570,370
October	.....	259,610	.....	65,079	.....	324,689
November	.....	295,134	.....	73,407	.....	368,541
December	.....	384,858	.....	84,260	.....	469,118
Total	.....	2,975,165	.....	757,553	.....	3,732,718

Business in Brief

***Written by the Guaranty Trust Co., New York, Exclusively for* AUTOMOTIVE INDUSTRIES**

Greater irregularity in the upward trend of general business activity has appeared in recent weeks. The index of *The Journal of Commerce* for the week ended Oct. 12, unadjusted for seasonal variations, stands provisionally at 113.3 per cent of the 1927-29 average, as compared with 113.0 for the preceding week. The New York *Times* adjusted index for the week ended Oct. 5 fell to 107.3 per cent of the estimated normal from 108.6 for the week before, as against 102.3 a year ago.

The Federal Reserve adjusted index of industrial production for September, according to the preliminary computation, is 125 per cent of the 1935-39 average, as compared with 122 for August and 113 a year ago.

Retail sales during the week ended Oct. 12, according to Dun & Bradstreet estimates, were from six to 10 per cent above corresponding 1939 levels. Department store sales during the four-week period ended Oct. 5 were five per cent above the comparable total last year, according to the Federal Reserve compilation.

Production of electricity by the power and light industry during the week ended Oct. 12 advanced more than seasonally and was 6.8 per cent greater than the output a year ago.

The rise in the movement of railway freight in the same period was slightly less than the usual seasonal increase. The number of cars loaded, 811,906, was 5920 above the figure for the week before but 28,046 below the comparable 1939 loadings.

Bank debits to other than interbank accounts in leading cities during the week ended Oct. 9 were nine per cent above the corresponding total last year.

Crude oil production during the week ended Oct. 12 increased substantially to an average of 3,641,550 barrels daily and was 60,950 barrels more than the required output as computed by the Bureau of Mines, in contrast with an average output in the preceding week 91,800 barrels less than the requirement.

Average daily output of bituminous coal during the week ended Oct. 5 was 1,403,000 tons, as against 1,692,000 tons both in the week before and in the comparable period last year.

Engineering construction contracts awarded during the week ended Oct. 17 rose to an unprecedented peak of $238,793,000, as compared with $56,228,000 a year ago, according to *Engineering News-Record*. For the year to date, the total is nearly equal to the awards throughout 1939, approximately $3,000,000,000.

Professor Fisher's index of wholesale commodity prices advanced further last week to 82.8 per cent of the 1926 average from 82.4 for the preceding week.

Excess reserves of the member banks of the Federal Reserve system rose $50,000,000 in the week ended Oct. 16 to an estimated total of $6,870,000,000. Business loans of the reporting members increased $42,000,000 during the week before and stood $384,000,000 above the total a year ago.

Census Reveals Big Gain In Tire and Tube Output

During 1939 U. S. Manufacturers' Production Totaled $497,636,438, An Increase of $19,000,000 Over 1937

During 1939 approximately $19,000,000 more of rubber tires and inner tubes were manufactured than in 1937 and, during the same interval, the production of reclaimed rubber dropped by over $1,000,000, according to preliminary reports on these two industries recently released by the Bureau of the Census.

The reports disclose that last year, $497,636,438 worth of tires and inner tubes was manufactured, compared with $478,770,897 in 1937, while the total value of reclaimed rubber processed during 1939 was $6,756,925 compared to $7,758,292 in 1937. The values quoted are those placed on the products at the factory.

A breakdown of the tires and inner tubes produced in 1939 discloses the fact that $435,303,639 represented the value of pneumatic tires and casings for motor-vehicles other than motorcycles and bicycles, with well over half of this figure—$269,241,421—being the value of tires and casings for passenger cars. Other figures given are $155,834,737 for tires and casings for trucks and buses, $544,823 for tires and casings for airplanes. All other tires and casings falling in this classification—odd size and specially built tires for tractors, trailers, artillery caissons, buggies, sulkies, baby carriages and so forth—had a factory value of $9,682,658. Though more truck and bus tires and casings were produced last year than in 1937—8,178,568 units compared to 7,702,436—the 1939 output was valued at slightly less than that for 1937—$155,834,737 as compared with $156,459,385. A larger number of airplane tires was produced in 1937 than last year. The 1937 production amounted to 32,710 units against 30,405 in 1939. The value of the 1937 production — $667,985 — was substantially higher than that for last year —$544,823.

More tires and casings for passenger cars and all motor vehicles, except motorcycles and bicycles, were made in 1939 than during the 12 months covered by the 1937 Census. Last year, 49,166,077 passenger car tires and casings were turned out by 53 plants. In 1937, the 46 factories then operating turned out approximately four million less tires and tubes—the total being 45,668,599. The 1939 output was valued at $269,241,421, that for 1937 at $253,270,878. Under the heading of "all other except motorcycle and bicycle tires and casings," the report reveals that 997,225 units were produced in 1939 compared to 709,700 in 1937. While the number of units produced in this classification was approximately one-fourth higher in 1939 than in 1937, the value of the production more than quadrupled, the 1939 figure—$9,682,658 was $7,315,108 above the figure reported in 1937—$2,367,550.

While the number of tires and casings for passenger cars and trucks and buses was higher last year than two years before, the number of inner tubes was under the total produced in 1937. During 1939 the inner tubes manufactured totaled 51,016,763 compared with 52,372,908 in 1937. The value of last year's output was estimated at the factories as being $52,510,944, whereas the output two years ago was valued at $55,739,387.

In the airplane inner tube field the trend was the other way. In 1939—27,192 inner tubes for use in airplane pneumatic tires and casings were produced against 25,026 two years before.

Though more single tube motorcycle and bicycle tires were manufactured last year—1,655,503 against 1,654,216 in 1937—their factory value was slightly less. A value of $1,202,485 was placed on the 1939 output by the manufacturers, while the 1937 output had been valued at $1,390,700, or approximately $190,000 more.

The number of casings made for motorcycles and bicycles last year was 1,550,000 over the number turned out in 1937—4,557,455 compared with 3,402,263. The value of last year's production was estimated by the manufacturers as $3,384,735. In 1937 the casings output was $3,191,864. Inner tubes for use in these casings numbered 4,404,351, well over a million above the 1937 total of 3,397,286, and were priced at $1,532,157 at the plants. The value of the 1937 turnout was reported as $1,186,697.

BOOKS . . . .

A.S.M.E. MECHANICAL CATALOG AND DIRECTORY, 1941. *Published by the American Society of Mechanical Engineers, 29 West 39th Street, New York, N. Y.*

This catalog, which appears in its thirtieth annual edition, consists, as in former years, of four sections, viz., a catalog section, giving brief descriptions of numerous items used by indus-

try in manufacturing its products and maintaining its plants; a directory indicating the source (and in many instances giving particulars) of equipment, machinery and supplies needed by mechanical engineers; a trade-name section which contains an alphabetical list of trade names, and an A.S.M.E. publications section.

Financing Off 0.5% In July

The dollar volume of retail automobile financing for July 1940 amounted to $166,034,312, according to the Bureau of the Census, Department of Commerce. This is a decrease of 0.5 per cent as compared with June 1940, an increase of 36.4 per cent as compared with July 1939, and an increase of 100.9 per cent as compared with July 1938. The volume of wholesale financing for July 1940, the Bureau reports, amounted to $141,977,131. This is a decrease of 12.4 per cent compared with June 1940, an increase of 41.3 per cent as compared with July 1939, and an increase of 131.7 per cent as compared with July 1938.

U. S. Motor Vehicle Taxes $1,912,223 In September

A comparative monthly statement of Internal Revenue Bureau collections show that manufacturers of automobiles and motorcycles were the source of $1,912,223 in taxes collected in September this year as compared with $3,575,969 the same month in 1939.

The bureau also collected $345,577 on trucks during September this year as contrasted with $938,771 the same month last year.

Knudsen Reports On Defense Contracts

Reveals That Over $8,000,000,000 Are Now Placed; $4,000,000,000 More Expected by End Of November

In a radio broadcast on Oct. 10, William S. Knudsen, head of the production section of the National Defense Advisory Commission, reported that defense contracts for more than $8,000,000,000 had been placed and that it was hoped to place an additional $4,000,000,000 by the end of November. He reminded his unseen audience, however, that placing the work with manufacturing firms is only the first step "after which follows the 'make ready' period when machine tools, shop drawings and fixtures, plus the necessary raw materials must be provided—after which production can proceed."

Mr. Knudsen said that production is being obtained to the extent of the tools which are available but pointed out that the quantities required of the important items are so great that all facilities for the making of combat equipment must be expanded several times their present size.

"Everything has been done at the start to use factories that have equipment which can be used in order that employment could increase and reduce the number of idle men looking for work," Mr. Knudsen said. "This has been accomplished to the extent that at least 400,000 men are employed over what we had on July 1. This will increase still more in the next months and I expect that employment will reach its peak in July, 1941."

Mr. Knudsen declared that the success of the program depends on support from all branches of American industry, banking, manufacturing, construction, engineering and everyone who works so that speed may be made. The response from people in all walks and stations of life was described as "marvelous." Mr. Knudsen said that they express confidence in "our ability to defend America against any aggression."

"With this spirit of the American people behind the program," Mr. Knudsen said, "and the willingness of everybody who works from machine worker to bench worker, to tool maker and engineer, we cannot fail to get the results which we in times past have always found possible."

Boeing Further Enlarges Plants

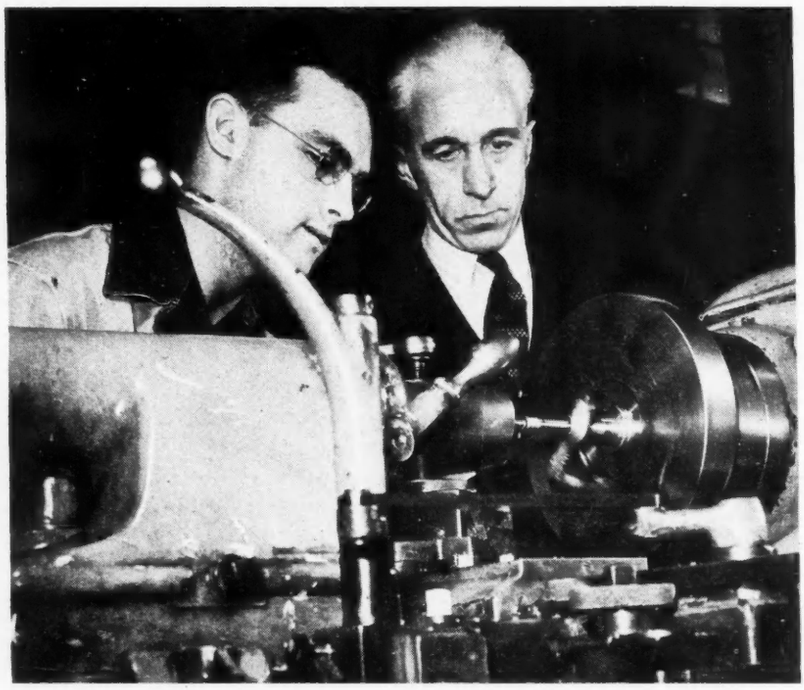
Further expansion of the Boeing Airplane Co.'s facilities for National Defense work recently announced will increase the floor area of the company's plants in Seattle, Wash., and Wichita, Kan., to a total of 74 acres. The Boeing plants, already enlarged to 2½ times their last year's area, will be nearly doubled again in size by the immediate construction of new additions totaling 1,600,000 sq. ft.

The expansion will increase substantially the production rate of four-engine Boeing Flying Fortresses and Stearman primary training planes.

Acme

Post-Blitzkrieg Buses

Because of the shortage of gasoline, some Paris buses are being converted to run on illuminating gas in place of liquid fuel. The gas is contained in an envelope enclosed in a wooden case on top of the bus. It is said that one filling will drive the vehicle about 15 mi. The photograph at the left shows one of the new type gas stations that are appearing in Paris. The fuel, tapped from a main, flows to the bus through the large tube. At the right is the first suburban bus in Paris to be equipped with the illuminating gas burning system.



Men and

The accompanying three "action" photographs were taken recently at the Pontiac apprentice school where 35 young men are now acquiring skill in tool and die making in a four year course. Fred Voelker, who appears at the lower right heads the teaching staff. David Dodd, an instructor, is shown at the upper right as he inspects the product of a die with a student. Harry Lumsden, another instructor, keeps a watchful eye on a student in the left hand picture as he turns out a locating pin.

By H. E. BLANK, JR.

WITH the tempo of defense production activity gaining speed hourly, there is a steadily mounting demand for men who are skilled in operating manufacturing equipment. It is encouraging at such a time to know that many industrial firms have been training apprentices for years in a very quiet, efficient manner to meet what is now an urgent need. Many machine tool and automotive companies have been especially progressive in this activity and to them much credit should accrue for their farsighted efforts to provide at least a partial answer to the currently vital question, "Where can we get skilled labor?"

A fine example of intelligent planning to provide fresh supplies of skilled workers is the apprentice school conducted by the Pontiac Motor Division of General Motors Corp. Pontiac began its apprentice program back in 1925. Since then many young men —for the most part the sons of Pontiac employes— have absorbed the skills of tool and die making in a four-year course.

Thirty-five youths are studying at the school at present. "Studying," incidentally, means actual, supervised work at $50,000 worth of up-to-date machinery. Students are paid 40 cents an hour to start and work a five-day week of 40 hours, as do their seniors in the plant proper. Every six months the wage is raised five cents an hour until during the last six months in school the student is receiving 75 cents an hour.

Upon graduation the students are presented with substantial bonus checks and many immediately accept jobs with the Pontiac organization. Others have gone into other lines. Fred Voelker, superintendent, states that one former student now is an airline pilot, others are engineers or hold similar positions of high responsibility in the tool industry.

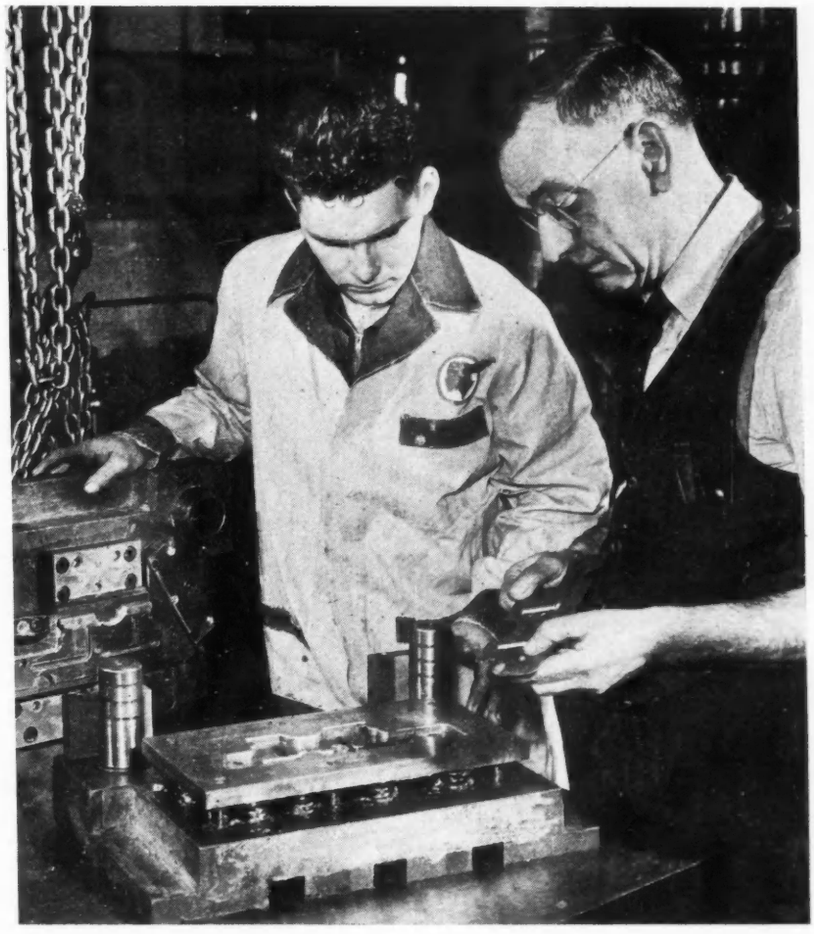
This modern method of developing skilled technicians is a far cry from the old method—still used in some industries—of teaming a youth with an experienced worker in actual production work and allowing him to sink or swim. There is an air of leisurely efficiency about the Pontiac school. Everything is spick and span. Several photographs reproduced herewith convey the atmosphere of the place better than words.

In discussing the school and its aims recently, Harry J. Klingler, president and general manager of Pontiac, said: "The need is not just for men but for competent men; men who can do things that need to be done. That means desire, effort, initiative on the part of the youths we take for training. Neither good mechanics or good soldiers are produced merely by the application of instruction and training to a man. The man has to reach for the training; take it in, make it a part of himself and himself a part of it."

AN INSTRUMENT especially designed for the inspection of parts manufactured on a mass-production basis which have a number of critical dimensions to be checked accurately is being offered by the Sheffield Gage Corp., Dayton, Ohio. It is called the Multicheck Electrigage and incorporates a number of gaging points so mounted that critical dimensions of the work under test are verified simultaneously.

Each gaging point actuates a signal light in a panel at the rear of the gage. When one of these signal lights shows amber in the gaging operation, the dimension is within tolerance. When the light shows red it indicates that the dimension is undersize, and when green, oversize. There is a master signal light which integrates all measurements. When the master signal shows white, all dimensions are within tolerance. When it shows red, the individual signal port lights are observed in order to determine which dimension or dimensions are incorrect and whether they are plus or minus.

Machines



After gaging the work part is removed and all signal lights may be arranged to come on immediately to assure the inspector that all elements are functioning properly. (Picture on page 506.)

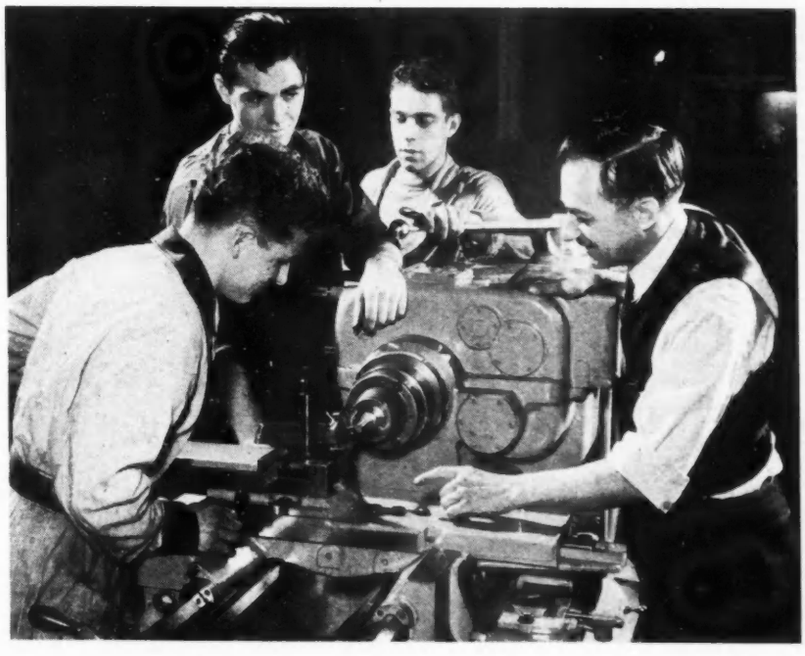
A HOB-CHECKING fixture intended for routine checking of hobs after sharpening is a new product of the Michigan Tool Co., Detroit. The fixture will check hobs for radial sharpening, spacing of flutes and runout of hubs. It also can be used for checking single form relieved cutters or form gashing cutters for sharpening and spacing. (Picture on page 507.)

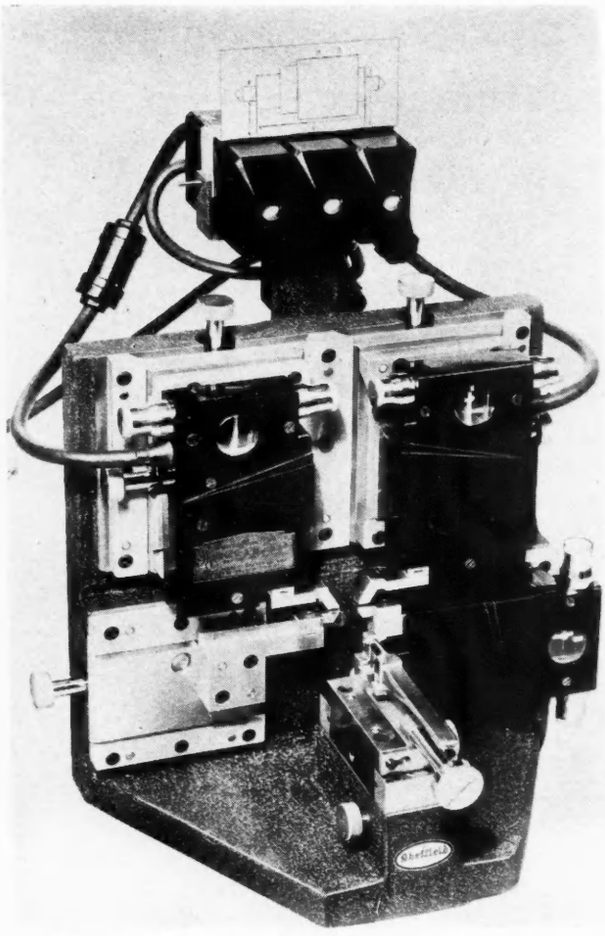
The fixture, illustrated herewith, is universal in character and has a maximum capacity of 12-in. diameter and 15 in. between centers. A dial indicator can be moved in both horizontal and vertical planes, while the head carrying the indicator can be moved parallel to the centers for checking at either end of a long hob. Up and down movement of the indicator is accomplished by means of a micrometer barrel having a graduated dial to permit setting to any desired exact amount.

In checking a radial flute, the indicator contact finger is brought up to center against the half block located on the tail stock, the top surface of this block being on exact center line of the fixture. The finger then is set to about ½ or ¾ revolutions of tension on the dial indicator, and the dial turned to zero. The radial condition of the flute then may be checked by noting whether the indicator reads "zero," while moving the indicator head in and out. For checking the runout on the diameter of the tool, or hub diameter, a bracket is provided on the side of the slide. A standard indicator for checking runout may be mounted on this bracket.

Inaccuracies in readings due to play at the centers is avoided by mounting the index plate on the arbor, permitting making the centers solid. Overall dimensions of the fixture are 38 in. by 25 in. by 20 in.

THE GLEASON WORKS, Rochester, N. Y., has announced a new machine for rough and finish-cutting the teeth of straight bevel gears. Known as the





Multicheck Electrigage for inspecting production parts which have a number of critical dimensions to be checked accurately. It is built by Sheffield Gage Corp.

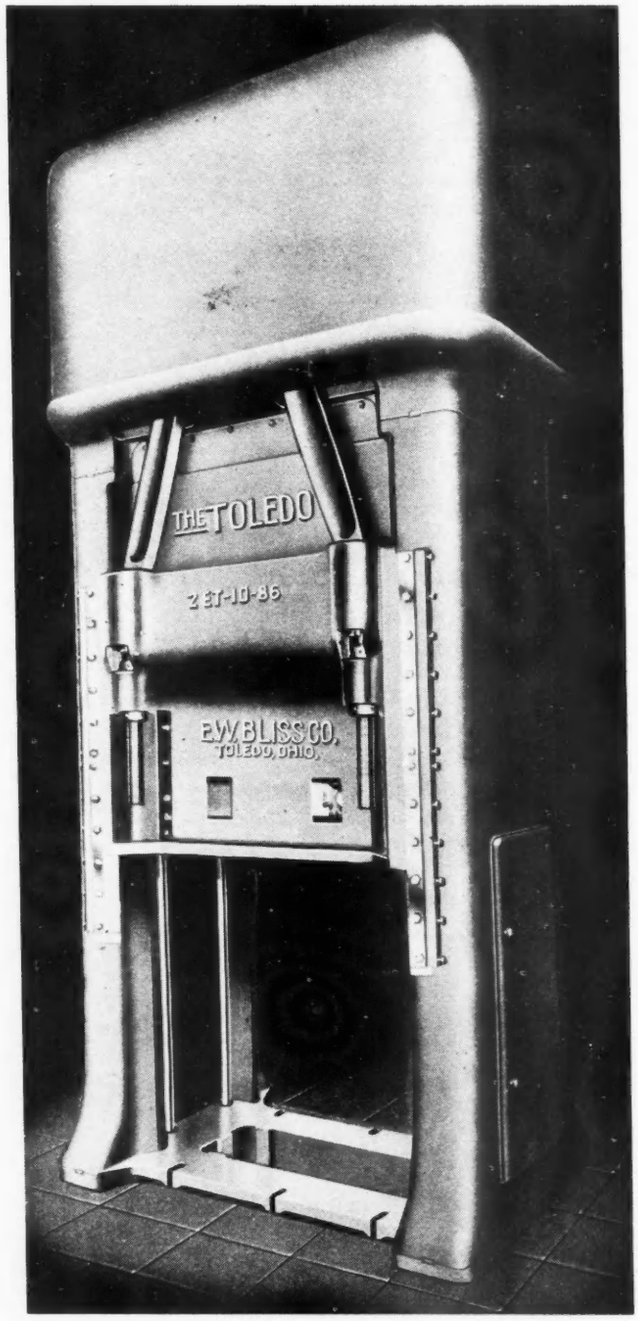
No. 24 Straight Bevel Gear Generator, the machine will handle straight bevel gears up to 35½ in. diameter with pitches as coarse as 1½ D.P. The principle of generating is that of a relative rolling motion between the reciprocating tools and the gear blank, the same as that used on the Gleason 12-in. Straight Bevel Gear Generator.

A new type tool relieving mechanism and tool slides on the No. 24 provide rigid tool support and permit higher stroke speeds than were previously possible on machines of this size. Tool-slide ways are cast-iron against hardened steel. A fully enclosed cradle is mounted on anti-friction bearings. Cradle reverse and index mechanisms are cushioned to give fast, smooth, quiet operation.

The work head is secured to a large base which slides on a heavy one-piece frame. Feed for tooth depth and withdraw for indexing are applied to the sliding base through a cam and adjustable lever. The cam has a double track, one track for rough-cutting and the other for finish cutting. A hydraulic in and out movement provides rapid movement of the work head to and from the chucking position.

Arranged standard, the No. 24 is equipped with a work spindle bored 6 in. nominal diameter at the large end with ¾ in. taper per ft. This facilitates chucking large shank jobs and permits faster cutting because of the increased rigidity. A new type of universal stock dividing gage accommodates all pitches within the machine range and can be used for either even or odd numbers of teeth.

Gearing of the new machine is made with improved accuracy, thereby insuring more accurate tooth profile. Adjustments of the feed and speed rate, the index, the ratio of roll, and the amount of roll are obtained by change gears. Automatic lubrication is provided.

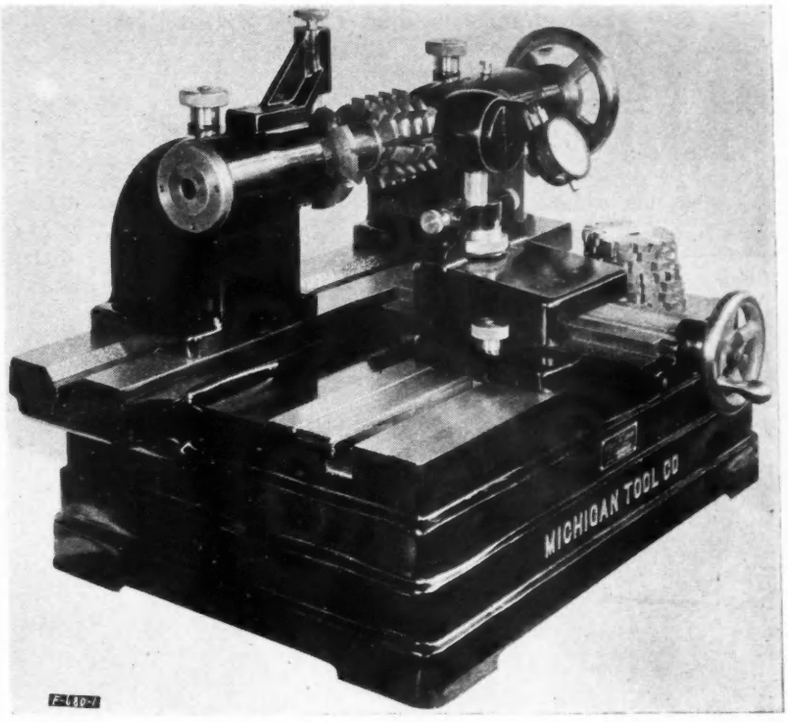


One of a new line of heavy duty toggle drawing presses now offered by the Toledo Machine & Tool Division of E. W. Bliss Co., Toledo, Ohio. It is of four-piece steel tie-rod construction with shrunk in tie-rods. Castings are of high alloy semi-steel. Essential specifications are, briefly, as follows: Bed area, 62 in. front to back by 86 in. right to left; capacity of plunger slide, 650 tons; distance from bed to slide with stroke down and adjustment up, 7.5 in.

H. O. BATES has developed a new name-plate stamping machine known as the No. 5. The new machine stamps name-plates, parts or pieces, from 0.005 in. to 3¼ in. thick and up to 9 in. by 7½ in. square. With this equipment it is possible to stamp letters or numbers on assembled manufactured parts or pieces, also name-plates after assembly where practical, providing over-all dimensions of the assembled part do not exceed a size of 9 in. by 8 in. by 3¼ in.

Up to nearly three tons pressure can be applied, permitting stamping letters and numbers into stainless steel and other metal alloys. Depth of impressions can be controlled for stamping soft materials and plastics.

The No. 5 machine is furnished with any one size of dies from 1/32 in. to 3/16 in., a complete alphabet and set of figures. Special characters can be substituted if desired and extra die wheels can be furnished where it is desirable to stamp several sizes with the one machine. Fixtures are made to order to hold shapes and contours that do not fit into the standard equipment.



Michigan Tool Co.'s new hob-checking fixture for routine checking of hobs after sharpening.

STANLEY TOOLS, New Britain, Conn., has developed a line of soft face hammers especially for use on assembly jobs requiring a hammer which will not mar finely finished surfaces or delicate machine parts.

OTHER new equipment offerings which have been brought to the attention of *Men and Machines* in recent weeks are, as follows:

The Hisey-Wolf Machine Co., Cincinnati, Ohio—This company recently completed the first lot of its new 5 and 7½ hp. pedestal type grinders. The machines are built in 18- and 20-in. sizes and can be supplied with guards which are built in accordance with the standards adopted by the American Foundrymen's Association.

The Delta Mfg. Co., Milwaukee, Wis.—Two new surface plates for layout work, measuring 15 in. by 8 in. by 3 in. and 16 in. by 22 in. by 3 in. are offered at a fraction of the cost of hand-scraped precision plates.

The Lewis-Shepard Sales Corp., Watertown, Mass.—Open end hydraulic lift truck especially adapted for moving lathes and other heavy machine tools through the production line.

Publications Available On New Equipment

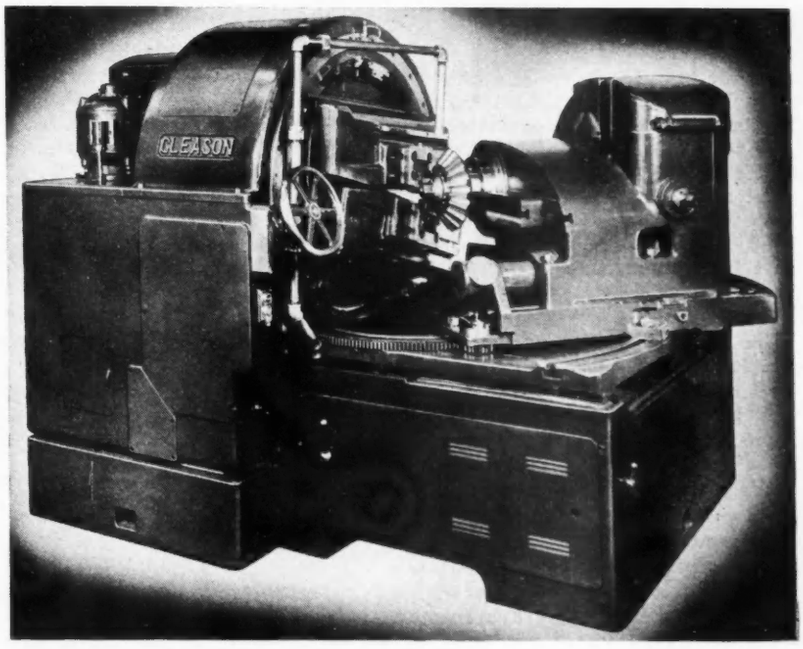
The Illinois Tool Works, Chicago, has brought out a new catalog of its products. It contains a considerable amount of useful engineering data on metal cutting tools. The company advises that due to the cost of publishing Catalog E, its distribution is limited to individuals who state their company affiliation or who make the request for a copy under their company letterhead.*

"Hobbing Data," a new book issued by the Barber-Colman Co., Rockford, Ill., contains a collection of case histories of actual field performance of the company's **hobbing machines and hobs.***

C. O. Bartlett & Snow Co., Cleveland, is distributing a new general catalog, No. 90, which gives complete details on its line of elevators and conveyors, chains and sprockets, crushers, gates and miscellaneous equipment.*

(*Turn to page* 552, *please*)

Gleason No. 24 Straight Bevel Gear Generator for rough and finish-cutting teeth of straight bevel gears up to 35½-in. diameter.



Passenger Car and Truck Production

(U. S. and Canada)

	September 1940	August 1940	September 1939	NINE MONTHS 1940	NINE MONTHS 1939	Per Cent Change
Passenger Cars—U. S. and Canada						
Domestic Market—U. S.	220,696	45,172	155,430	2,390,688	1,832,572	+30.4
Foreign Market—U. S.	3,774	1,651	6,195	76,804	123,349	−37.7
Canada	3,410	1,510	3,494	80,603	79,642	+ 1.1
Total	227,880	48,333	165,119	2,548,095	2,035,563	+25.2
Trucks—U. S. and Canada						
Domestic Market—U. S.	39,487	26,778	20,778	454,292	392,458	+16.0
Foreign Market—U. S.	5,151	2,272	6,354	83,428	111,594	−25.2
Canada	12,065	12,483	428	74,245	30,755	+142.0
Total	56,703	41,533	27,560	611,965	534,807	+14.8
Total—Domestic Market—U. S.	260,183	71,950	176,208	2,844,980	2,225,030	+28.0
Total—Foreign Market—U. S.	8,925	3,923	12,549	160,232	234,943	−31.7
Total—Canada	15,475	13,993	3,922	154,848	110,397	+40.7
Total—Cars and Trucks—U. S. and Canada	284,583	89,866	192,679	3,160,060	2,570,370	+23.0

Two New Cars Appear On Japanese Scene

Toyota's Five-Passenger, 48 Hp., "All-Weather", 98½-In. Wheelbase Phaeton Earmarked For Export

Introduction of two new car models by the Toyota Automobile Co. is the first automotive activity of this kind in Japan since the outbreak of Sino-Japanese hostilities three years ago. Need for quantity production, which became more imperative as the war progressed, precluded experimentation with new designs and styles.

The status quo might have continued another year or two if manufacturers had been catering to the domestic car market alone. However, the inability of Germany, France and Italy, and to some degree, Great Britain to continue business in the automotive markets of southeastern Asia and Oceania has revived old Japanese export ambitions, and buyer response has not been altogether unfavorable.

Of the two Toyota models which recently made their bow, the smaller type, in particular, has been earmarked for export, its sale at home being severely restricted. It is an "all-weather" phaeton on a 250 cm (98½ in.) wheelbase, with a seating capacity for five. The type has been popularized in Dutch East India and Australia through the English Ford, the Opel, Adler, Fiat and Citroen.

The vehicle is powered with a four-cylinder valve-in-head Toyota engine of 84.14 mm (3.31 in.) bore and 102 mm (4.02 in.) stroke, making a total piston displacement of 2268.6 cu. cm (138.42 cu. in.). The engine is rated 48 hp. at 2600 r.p.m. Transmission is of the syncro-mesh type, with three forward speeds and one reverse. The vehicle is equipped with four-wheel hydraulic brakes. Equipment of foreign design includes a Carter downdraft carburetor, Delco-Remy ignition and generator, and a Bendix starting motor, all built by Toyota under license.

The larger sedan model is an improvement on the old Toyota and follows current American design. Both models have been named Shin Nippon (New Japan).

The success of Japan's export drive remains to be seen. Although, no doubt, export prospects in the small-car field have been enhanced by the withdrawal of European competition and the hesitancy among American makers to cultivate this market, the lack of a Japanese sales and service organization abroad is a drawback which may be difficult to overcome. This is partially offset by Japan's more favorable freightage position. Political factors also favor Japan.

The countries which have been singled out as markets sell more to than they buy from Japan. During the first five months of 1940 Japan bought 58 per cent more from territories in Asia outside the "yen bloc" then she did in the corresponding period of last year. This, if anything, is the first step towards creation of Japan's projected "co-prosperity sphere" in Asia, which, in plain language, means that Japan is going to foist her manufactured products on her suppliers of raw materials because she has no other means of paying for them.

A release by the Bank of Japan discloses that more capital is invested in Japan's machinery industry (including automobile and aircraft manufacture, shipbuilding, electrical engineering, etc.) than in any other industrial group, including the chemical industry, which until a few weeks ago was at the top. Investments in shares and debentures of machinery concerns now total 3024 million yen, as compared with 2387 million yen a year ago.

Meanwhile, two new capital expansions have been licensed in the automotive industry. The Toyota Automobile Co. has been authorized to call in 4,500,000 yen on its unpaid shares, and the Japan Internal Combustion Engine Co., to increase its share capital by 5,000,000 yen.

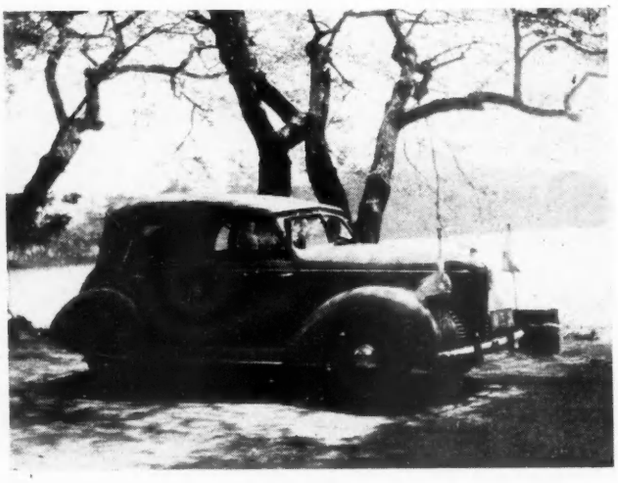
Employment in vehicle and shipbuilding plants has increased 79 per cent since the outbreak of the China "incident," and in machine-tool plants, as much as 131 per cent. These two industries now employ 900,000 workers according to the Cabinet Bureau of Statistics.

MEN . . . . . .

Charles Getler, president of Houdaille-Hershey Corp., has been elected a member of the board of trustees of Illinois Institute of Technology.

Hugh Dean, Chevrolet general manufacturing manager, has been elected to a second term as board chairman of the Detroit Industrial Safety Council.

Delmar G. Roos, chief engineer of Willys-Overland Motors, Inc., has been elected to the board of directors. He



Toyota

One of two new model automobiles introduced recently by the Toyota Automobile Co. of Japan. It is intended primarily for export.

came to Willys in 1938 from Humber, Hillman, Talbott, Sunbeam, Ltd., of England. Roos designed the new American car line of Willys motor cars for 1941.

Frank T. Tucker, manager of B. F. Goodrich Co. tire advertising since 1932, has been named director of advertising of the company. He succeeds **P. C. Handerson**, director of advertising since 1931, who resigned to engage in general advertising work.

Harold B. Thomas, one of the founders of the Elastic Stop Nut Corp., Union, N. J., and vice-president in charge of sales, has resigned to enter consulting work in industrial product analysis and market research. He remains active as a director and member of the executive committee of the corporation.

Richard P. Dodds, advertising and sales promotion manager of the Truscon Steel Co., Youngstown, Ohio, was elected president of the National Industrial Advertisers Association at its recent annual conference, held in Detroit. Vice-presidents elected were: **E. J. Goes**, Koehring Co., Milwaukee; **Herbert V. Mercready**, Magnus Chemical Co., Garwood, N. J.; **Terry Mitchell**, Frick Co., Waynesboro, Pa.; **W. D. Murphy**, Sloan Valve Co., Chicago; **Louis J. Ott**, Ohio Brass Co., Mansfield, Ohio; **R. T. Reinhardt**, California Corrugated Culvert Co., Berkeley, Calif. **E. C. Howell**, of the Carboloy Co., Detroit, was elected secretary-treasurer. **Mildred R. Webster** is national headquarters secretary in Chicago.

August Johnson has resigned as executive vice-president of the Graham-Paige Motors Corp.

John J. Downey has been named sales promotion manager of the Studebaker Corp. Besides being sales promotion manager, Mr. Downey will supervise the editing of *The Studebaker News* and *The Wheel.*

Dr. H. A. Millis, professor emeritus of economics of the University of Chicago, has been selected as the permanent umpire under the terms of an agreement between General Motors Corp. and the UAW-CIO. Dr. Millis will make his headquarters in Detroit.

Joseph Geschelin, Detroit Technical Editor, AUTOMOTIVE INDUSTRIES, is scheduled to address the Cleveland Section of the Society of Automotive Engineers on Nov. 11, and the Indiana Section, SAE, on Nov. 14. His subject will be an analysis of the mechanical and design features of the 1941 motor cars.

David G. Forman has been appointed assistant to Lawrence D. Bell, president of the Bell Aircraft Corp., Buffalo, N. Y.

C. E. Wilson, acting president, General Motors Corp., and **B. E. Hutchinson**, vice-president and chairman of the finance committee, Chrysler Corp., have been elected directors of the Automobile Manufacturers Association. Mr. Wilson replaces William S. Knudsen, former General Motors president and now in charge of the production division, National Defense Commission. Mr. Hutchinson was named to fill a previous vacancy on the board.

L. S. Harris has been appointed executive director of the American Association of Motor Vehicle Administrators.

H. J. French and **T. N. Armstrong, Jr.**, of the International Nickel Co., Inc., New York City, have been awarded the Lincoln Gold Medal, donated to the American Welding Society by James F. Lincoln, president, Lincoln Electric Co., Cleveland. Presentation of the award was made at the American Welding Society's annual meeting.

Chester A. Thompson has purchased the Otto Konigslow Mfg. Co., Cleveland, Ohio, manufacturers of light and me-

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dium weight stampings. Mr. Thompson will operate the business as an individual under the company name. He will be assisted by **Rodney C. Murphy. Otto Konigslow** and **M. E. Konigslow** will continue with the company.

John Haien, who has been on leave of absence from the Chrysler Corp. since last May to coordinate work of the National Youth Administration with the national defense program, has returned to his position of director of youth activities with the corporation. He plans to expand the work of the Chrysler Junior Craftsmen to embrace 1200 employes' sons who will meet two hours weekly during the winter.

Huge Sales Of Aircraft Firms In 1939 Reported

FTC Data On Nine Major U. S. Producers Show Total Amounted To $255,004,218

Total net sales during 1939 by nine of the most important American aircraft corporations amounted to $255,004,218, as compared to $171,016,224 in 1938, according to the Federal Trade Commission. Costs and expenses applying to goods sold last year, or the total operating outgo, amounted to $208,787,934, as compared to $145,434,398 in the earlier year. These costs and expenses included raw materials, wages, taxes, depreciation, etc.

The figures are disclosed in a report on "Aircraft Manufacturing Corporations." It is the first released in the FTC's project of collecting financial and other information from a large number of corporations operating in many of the principal industries of the United States.

The combined net income of the nine "aircraft" corporations before payment of income taxes for 1939 amounted to $45,405,826 on an average investment of $131,827,219, and this income represented an average rate of return of 34.4 per cent for this group. The individual rates of return ranged from a loss of 60.5 per cent for one corporation to a gain in rate of return of 98.8 per cent for another corporation. The rate of return on the average capital employed of $112,375,309 during 1938 was 24.2 per cent.

The nine corporations realized a net income, after provisions for the payment of income taxes, amounting to $35,663,658 in 1939, and $21,872,031 in 1938. The nine corporations paid cash dividends amounting to $11,361,178 for 1938 and $20,194,804 for 1939, and these dividends represented a return of 10.2 per cent and 15.4 per cent, respectively, to the stockholders when related to the ledger value of their equity.

A. Ralph Sandt

A. Ralph Sandt, executive secretary of the Automotive Electric Association, with headquarters in Detroit, died suddenly on Oct. 8 of a heart attack.

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CALENDAR

Conventions and Meetings

SAE Nat'l Aircraft Production Meeting, Los Angeles ..... Oct. 31-Nov. 2
SAE National Fuels & Lubricants Meeting, Tulsa, Okla. ..... Nov. 7-8
American Society of Mechanical Engineers, Annual Meeting, New York City ..... Dec. 2-6
Aeronautical Chamber of Commerce of America, Inc., Annual Meeting, New York ..... Dec. 5
National Association of Manufacturers, Annual Meeting, New York ... Dec. 9-13
SAE Annual Meeting, Detroit, Jan. 6-10, 1941
National Automobile Dealers Association, Convention, Pittsburgh, Pa. Jan. 20-23, 1941

Shows at Home and Abroad

Automotive Service Industries Show, Chicago ..... Dec. 9-14
Machine & Tool Progress Exhibition, Detroit ..... Mar. 24-29, 1941

Aircraft Program

(*Continued from page* 499)

400 parts are involved in the project which will speed the manufacture of 12,000 planes of the two largest types included in the present military aircraft procurement schedule. These presumably are the Boeing four-engine flying fortresses and Douglas bombers.

With detailed plans, production methods and time schedules to be worked out, it was emphasized that the work would have to be diffused widely, employing as much as possible of the adaptable and readily available production capacity. The high volume of employment involved in the program also may prove an important reason for decentralization of the work. Sample aluminum stampings and forgings and blueprints were shown at the meeting.

The program probably will not get under way until next spring and this initial $500,000,000 order will take probably a year for completion. In a press parley between sessions, Knudsen said he could see no marked interference with automobile production. Queried regarding the possibility for 1942 models, which the manufacturers voted to subordinate to the necessities of the defense program at a meeting in New York Oct. 15, Knudsen said:

"Maybe the industry can superimpose the normal production on top of the defense load, but we will have to wait and see."

Observers pointed out that if this aircraft parts program did not get under way until spring, the industry might still have time to take early advantage of tool and die facilities for 1942 model changes before those facilities are needed for national defense work. It also is possible to make minor changes in body trim, chrome and interior decoration without extensive retooling.

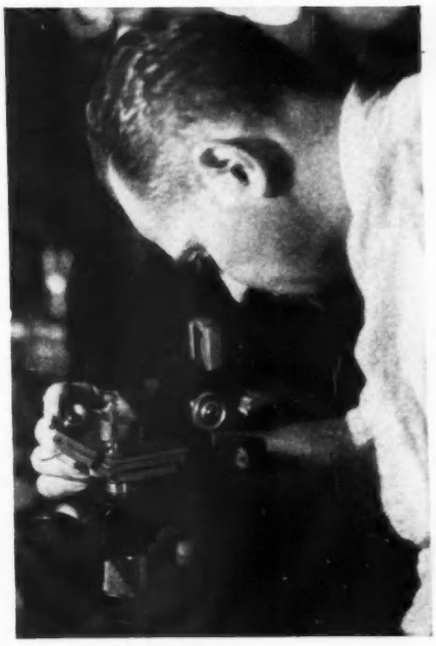
As an indication of what the industry will be asked to manufacture, the Douglas Aircraft Co. revealed that a major part of $75,000,000 in subcontracts for plane subassembles would be placed with three Detroit firms—Murray Corp. of America, Briggs Mfg. Co. and Fisher Body Division of G. M. Murray is prepared to employ 10,000 men in its new aircraft division for the manufacture of wing surfaces for Douglas. Plenty of space is available in its Detroit plant. Briggs is just building a new aircraft plant with 250,000 sq. ft. of floor space and will employ 2000 men when it is completed Dec. 1. Briggs already is working on an order for outer wing panels for seven Vought-Sikorsky navy fighter planes. It is understood Fisher Body will do the tooling for these Douglas subassembles in its Detroit plants, with Murray and Briggs turning out the wings.

This is the first work on plane wings and fuselages to come to Detroit plants, which previously have concentrated on tooling for airplane engine production such as is now under way by Packard, Ford and Continental.

"Jeep"

The Minneapolis-Moline Power Implement Co.'s new "Jeep" model tractor shown in action with trailer on recent army maneuvers.

Buy Steel with LABORATORY CERTAINTY -at Ryerson



Every shipment of alloy steel is accompanied by accurate data based on laboratory tests, covering exact chemical and physical properties, grain size, cleanliness rating and hardening characteristics. With the Ryerson data sheet before you, you know what steel you are getting, you secure best heat treatment results and you save time because you do not have to test.

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Ryerson Steel-Service is geared particularly to the needs of defense industries. All Ryerson products are painstakingly selected for their uniform high quality. They are carefully warehoused, accurately cut to your specifications, and shipped on the dot from ten convenient stocks of over 10,000 sizes, kinds and shapes.

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RYERSON CERTIFIED STEELS

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Much New Equipment Shown at Metal Show

About 350 Industrial Firms Displayed Their Latest Products At the Twenty-Second Annual Exhibition Held Oct. 21 to 25

The twenty-second Annual National Metal Exposition held in Cleveland, Oct. 21 to 25, was easily the most ambitious of the annual events sponsored by the American Society for Metals. Almost 350 of the most prominent organizations in the industrial field—suppliers of steels, alloys, non-ferrous metals, tool steels, welding equipment, chemicals, heat treating, and instrumentation—displayed their products in an area of over 100,000 sq. ft.

A quick examination of the individual exhibits uncovered many interesting new developments in a variety of allied fields. A new brass plating process two to four times the speed of current processes was demonstrated by the Electroplating division of du Pont. It makes possible heavy, bright deposits—0.001 in. or more in thickness—in a reasonable time at relatively low operating temperatures. This technique should be of great value in automotive work. Another du Pont development is the introduction of a method of producing Neoprene-coated metal strip, used at the moment in the manufacture of plating clips and other parts intended for use in plating processes.

Westinghouse demonstrated its new Endogas balanced atmosphere heat treating equipment for hardening all types of steels clean and scale-free without surface decarburization. The Endogas atmosphere is produced in a reaction unit from fuel gas, either natural or manufactured, with simple controls which make the composition easily adjustable for the requirements of any SAE steels.

A new hydrogen brazing furnace, shown by Hoskins Mfg. Co., is intended for the treatment of small parts such as the copper brazing of tungsten-carbide tips to steel; also for brazing with silver solder or bronze. Economy is the chief talking point with emphasis on low hydrogen consumption and low initial cost for the equipment.

Detroit Rex Products introduced a new line of Detrex washing machines using alkali compounds, petroleum spirits, or emulsion cleaners. The principle is employed for building special machines to meet individual requirements, for aircraft producers, and for automotive parts production.

In addition to its line of Wheelabrators of various forms, The American Foundry Equipment Co. demonstrated the new high efficiency Cyclone dust collector of the long cone type. Unusually high efficiencies are claimed for this unit, coming within a small percentage of the results achieved with more costly filter type collectors.

A rotary flame hardening machine developed by The Lakeside Steel Improvement Co. is said to assure uniform hardening of cylindrical parts such as pins, rolls, shafts, axles, gears, etc. Work is set in a vertical position on a revolving work table while torches travel upward, insuring uniform heating and quenching.

A new line of continuous, automatic rotary type polishing and buffing machines, known as the Packer-Matic, was introduced by The Packer Machine Co. The new No. 4 rotary machine, with an unusual pedestal design, offers from one to four wheel head stands which can be quickly attached or detached.

Pure nitrogen—controlled N_2—is produced at low cost in the Mahr nitrogen generator made by the Mahr Mfg. Co., for gas carburizing, for bright hardening, and for bright annealing operations.

Stresscoat Division of the Magnaflux Corp. offers a method of stress-strain analysis from crack formations in applied brittle lacquer coatings in the

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study of the distribution, direction, and value of local strains in any structure. Stresscoat is applicable to practically all engineering materials including ferrous and non-ferrous metals as well as the non-metallics, such as wood and plastics. In effect the coating constitutes a strain gage which permits an evaluation of stress concentrations with an effective gage length as small as 0.05 in.

La Salle Steel Co. demonstrated the increasing utilization of Stressproof No. 2 cold finished bars in automotive mechanisms, a particularly interesting application being the use of this material for the major parts of the McCullough supercharger for aircraft and marine engines. As may be well known to our readers, this material requires no heat treatment and is particularly useful in places where fire distortion is particularly troublesome.

Owens-Corning Fiberglas Corp. disclosed the development of Fiberglas electrical insulation materials made from Fiberglas yarns, including: magnet wire insulation tapes, and cloth used as a base in the fabrication of varnished cloth or cambric, etc. These materials promise a revolutionary change in the design of motors and electrical equipment for automotive purposes. For example—"The Motor of Tomorrow"—as compared with conventional practice, can be built to weigh a third less and almost half the physical dimensions without sacrifice in output or life.

A large area was set apart for exhibits of the American Gas Association, featuring the product of some 15 cooperating companies and including heat treating equipment made by Surface Combustion Co., American Gas Furnace Co., Despatch Oven Co., and others.

Electric Furnace, Ajax, and other producers of electrically-fired heat treating equipment had exhibits in other sections of the auditorium.

Another of the large association groups was the Resistance Welder Manufacturers Assoc., with examples of the latest products of its members—Acme Electric Welder, American Electric Fusion Corp., Eisler Engineering, Expert, Multi-Hydromatic, National Electric Welding Machines, Progressive Welding, Swift, Taylor-Hall, Taylor-Winfield, Thomson-Gibb, Welding Machines Mfg. Co. Associate members of the group comprise—P. R. Mallory, who was represented by a fine booth of its own, featuring welding electrodes, silver contacts, etc.; S-M-S Corp., a prominent supplier of welding electrodes; Electroloy, Inc., Welding Sales & Engineering.

A group of 37 prominent screw machine parts producers were represented by the American Institute of Bolt, Nut, and Rivet Mfrs. Theme of the exhibit was "Cold Forging Aids Mass Production," emphasizing the savings due to the use of cold-forged screws and bolts.

Accenting the wide acceptance of the Tocco hardening principle, The Ohio Crankshaft Co., took ample space to demonstrate the operation of a large number of the new Tocco Junior machines. Latest of these is a Tocco Jr. designed for the induction hardening of rocker arm shafts for a prominent builder of over-head valve truck engines. This unit is semi-automatic in action, capable of heat treating 600 areas per hour.

Aluminum Co., of America, as usual had a handsome display illustrating the

40 YEARS AGO

A meeting of automobile manufacturers was held in the press room of the Garden at 10:45 Saturday (Nov. 10). Over thirty firms were represented. John Brisben Walker, of the Mobile Company of America, was elected temporary chairman, and S. Ralph Estep, of the *Motor Age*, temporary secretary. A committee of eleven was elected to take in hand the preparation of a permanent organization of automobile and accessories makers, and to have power to draft a constitution and by-laws, select officers for the first year and to secure a certificate of incorporation.

—From *The Horseless Age*, November, 1900.

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LIFELONG ACCURACY

● Thermostatic controls—small devices with big responsibilities—left without attention for long periods—doing their jobs automatically. As moving parts they wear out just as automobiles do eventually—BUT here's the key to consistent performance:

DOLE BI-METAL, the actuating force in Dole Thermostats, does not *fall off gradually* in efficiency. It will flex an indefinite number of times without fatigue. This means these elements CAN be left without attention for long periods to do a control job automatically, just as well the 5000th time, or 5,000,000th as the first—right up to the point where other moving parts fail. Elements of Dole Bi-Metal will, like faithful servants, work until they drop . . . and work accurately to the last.

Dole Bi-Metal Sold Separately

This special qualification recommends Dole Thermostats as motor temperature controls for your cars—or Dole Bi-Metal as raw or partly fabricated material for any thermal control devices you make. Write for engineering data or buying information on either or both.

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DOLE THERMOSTATS and BI-METAL

current applications of aluminum and its alloys in forgings, in extrusions, in sand castings, die castings, etc. In addition, there was a motion picture which attracted considerable attention.

Linde Air Products had on display various items of flame-cutting and torch welding equipment; also devoted a section to the products of the Haynes-Stellite division.

Air Reduction, prominent with demonstrations of welding and cutting with the torch, displayed its new No. 10 Planograph shape cutting machine as well as the latest flame-hardening equipment.

Another important member of the gas welding fraternity was the National Cylinder Gas Co., featuring its nation-wide coverage of the field through the hook-up of the parent company with Rego, Hollup, and Compressed Industrial Gases, Inc. Demonstrations were given of flame cutting, flame blasting, flame hardening.

Carboloy and Firth-Sterling each had excellent displays of their cemented-carbide cutting tools, with Carboloy emphasizing its latest developments in the field of wire drawing dies.

E. F. Houghton made an interesting display of its specialty products for metal working industries, including the latest Cut-Max cutting oils, soluble cutting oils, core oils, drawing and tempering salts, cleaning compounds, etc.

D. A. Stuart and Tidewater also featured their lines of cutting fluids for the metal working trades.

N. J. Zinc Co., repeated its usual fine exhibition of current examples of zinc alloy die castings, showing applications both in the automotive and the general industrial field. In the automotive group were the latest radiator grilles, body hardware, instrument panel castings, and other details.

International Nickel carried on with a display of applications of alloy steels and cast irons containing nickel; also demonstrated the weight-saving possibilities of corrosion resisting nickel alloys.

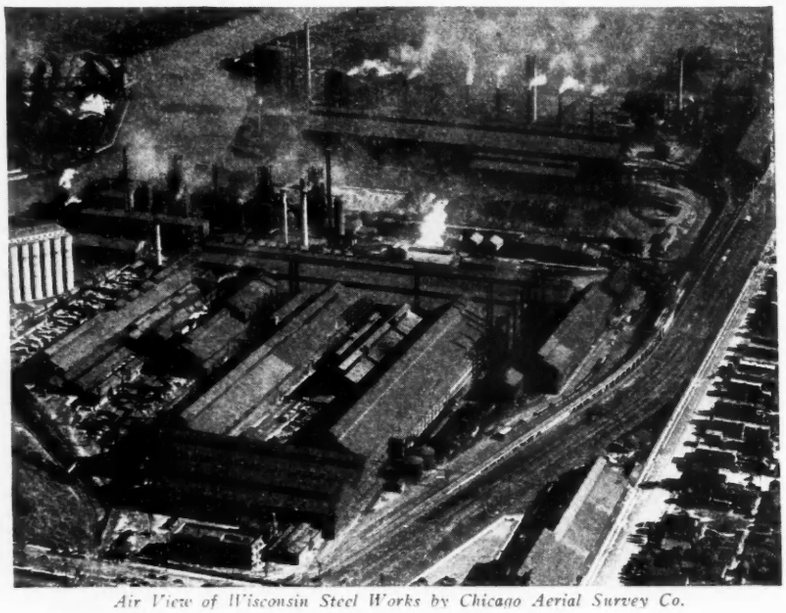
Republic Steel and its subsidiaries had a magnificent exhibit stressing applications of its products, showing aircraft engines and parts, and an armored White army scout car. In a section of the booth devoted to Union Drawn Steel was a demonstration of the machinability of two new steels—Union Maxcut, a fast cutting Bessemer steel and Union Multicut, a fast cutting open hearth steel. Both types were processed in a large National Acme-Gidley automatic which was in operation at regular intervals.

Bethlehem Steel Co., was another large exhibitor. This company attracted attention by its miniature models of an electric furnace and a working model of a small wire cable mill. Particular emphasis was given to the Bethlehem series of tool steels for cutting tools and for dies and punches.

U. S. Steel and its subsidiary companies had an interesting booth arranged in radial form with a segment set apart for each division. A machinability demonstration drew large crowds of metallurgists and factory executives not only because of the metal cutting exhibition but also because of the novelty of the equipment and instrumentation. Cutting was done on a Gisholt No. 4 turret lathe, results being shown on a large panel fitted with visual dial instruments. There were five instruments in all—a dial indicating tool pressure at the cutting edge, another for the recording of temperatures at the tool point, one for tool life in minutes, and one for surface cutting speed. In addition, a picture of simultaneous changes in pressure at the tool point was given by an oscillograph record projected on a screen at the center of the board.

Finally, out of the hundreds of other exhibits mention should be made of the presentation of powdered metals by the Metals Disintegrating Co.; the Macklin grinding wheel booth with its interesting panorama of a miniature foundry scene with model snagging grinders in actual operation; Clark Controller with its presentation of the new kickless watercooled cable for portable welders; Driver-Harris with its excellent ex-

The Right "FOLLOW THROUGH" Counts in Making Quality Steel



Air View of Wisconsin Steel Works by Chicago Aerial Survey Co.

Users of alloy and carbon steels recognize the value of dealing with a firm that "follows through."

Wisconsin Steel maintains a rigid "follow through" policy. It begins when the salesman writes the order. It continues through every operation at Wisconsin Steel's modern, up-to-date plant. A competent staff sees that the finished product measures up to the most exacting specifications.

Wisconsin Alloy and Carbon Steels are being used successfully by manufacturers in many lines of business. Ask us to point out how your business can benefit from Wisconsin Steel's "follow through" policy. We are well equipped to supply a full range of alloy and carbon steels, as well as high quality pig iron that is "better controlled from mine to mold." Write or phone us. Inquiries will receive prompt attention.

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WISCONSIN STEEL

More Power To You

Compression ratios in engines of the 1941 cars show the sharpest rise in five years, averaging 6.66 in 50 new models presented by 17 manufacturers. The average last year in 58 models from 20 manufacturers was 6.43.

A report issued by the Ethyl Gasoline Corp. discloses a consistent upswing in power output, in compression ratio, and in antiknock value of fuels. In 1925, automobile engines averaged about 60 hp., the compression ratio was 4.34, and the estimated antiknock value of gasoline was about 55 octane. Powerplants in the current models have an average horsepower of 115, while regular grade gasoline, the report states, has an octane value of about 75.

The Ethyl laboratories in Detroit are completing successful tests with engines having compression ratios above 11, requiring fuel of decidely higher anti-knock value than is now generally available. Gasoline of 95 octane, in the opinion of Earl Bartholomew, director of the Ethyl laboratories, will be in supply at roadside service stations within the next five years.

Among the 1941 cars, at least 10 models have compressions of 7 or more. Optional compression ratios of 7 or more are available on a number of cars having slightly lower standard compression ratios. At least 25 of the new models have higher compression ratios than last year.

amples of engineered products made from D-H heat and corrosion resisting alloys—pots and boxes for carburizing and cyaniding, parts for furnace conveyors, etc.

Important displays also were made by the suppliers of non-ferrous materials, such as Anaconda, Bridgeport Brass, American Brass, Revere Copper, Chase Brass & Copper, and others.—J. G.

Output of Plastics In '39 Up 20.5% Over '37

Production of plastic materials in 1939 was valued at $63,054,576, a gain of approximately 20.5 per cent as compared with $52,317,797 in 1937, according to the Bureau of the Census. The output of all products of the industry rose to a value of $77,653,314 from $66,955,407.

Cyanide Plating Baths

The cyanide plating baths are important commercially for the deposition of copper, silver, gold, zinc, cadmium, and alloys, such as brass. They are prepared by dissolving a salt (usually the cyanide) of the heavy metal in a solution of alkali (sodium or potassium) cyanide. On dissolving, chemical combination takes place between the heavy metal cyanide and the alkali cyanide with the formation of one or more soluble complex cyanides. The problem of the constitution of the baths consists in identifying these metallocyanide complexes in solution. Knowledge of constitution is to a considerable degree necessary for understanding the properties and method of operation of the baths, and for predicting the direction of improvement or development to be based upon research.

A paper by M. R. Thompson, which has been submitted for publication in the Transactions of the American Electrochemical Society, reviews and summarizes much of the available information on cyanide plating baths. A discussion is given of the relation between probable constitution, analytical control, and certain operating characteristics (such as current efficiency and polarization) of cyanide solutions of most of the heavy metals which form stable cyanides. A summary of the constitution of the cyanide plating baths is included, but any such list cannot be exact at this time and may need revision as new data are obtained.

An EMERGENCY OPERATION that became a PERMANENT CURE!

PATIENT:
An 8 foot fan ventilating an entire Central Office Building.

CASE HISTORY:

(a) *Ailment.* Bearing burned out and 5 inch shaft supported by bearing badly scored.

(b) *Condition.* Replacement of shaft difficult and expensive due to cramped fan installation.

(c) *Previous Treatment.* New bearing installed. Threw oil badly. Shims between sleeves removed and tighter fit effected. Oil leakage present. Heavier oil tried without improvement.

(d) *The Cure.* To the two quarts of oil which the bearing holds was added two ounces of "DAG" COLLOIDAL GRAPHITE Fan was run intermittently for a total of 60 hours over a three week period. Leakage still apparent. Shims again removed and fan run for 100 hours over a three week interval. Overheating and leakage disappeared.

(e) *Patient Discharged.* Fan now operating 24 hours a day and has been doing so since March 13, 1940. A permanent cure of a stubborn case without need of shutdown and expensive repairs.

In the above, the graphite formed a self-lubricating, "stay-put" surface on the friction parts which permitted maintenance of the seal. Write for Bulletin 112.

ACHESON COLLOIDS CORPORATION
PORT HURON, MICH.

dag COLLOIDAL PRODUCTS

We are exhibiting (Booths 228-229) at the 14th National Exposition of Power & Mechanical Engineering ("Power" Show) Grand Central Palace, New York, Dec. 2 to 7, 1940

Estimated Dealer Stocks of New Passenger Cars

1939	July	August	September	October	November	December
Production—U. S. Domestic Market †	142,346	56,245	155,430	239,150	272,747	357,712
Retail Sales—U. S. ‡	229,873	166,172	139,222	236,584	257,398	274,233
Change in Inventory	−87,527	−109,927	+16,208	+2,566	+15,349	+83,479
Inventory, First of Month	295,708	208,181	98,254	114,462	117,028	132,377
1940	**January**	**February**	**March**	**April**	**May**	**June**
Production—U. S. Domestic Market †	348,755	324,555	341,634	351,814	315,441	276,949
Retail Sales—U. S. ‡	239,509	236,857	338,153	353,423	330,521	350,871
Change in Inventory	+109,246	+87,698	+3,481	−1,609	−15,080	−73,922
Inventory, First of Month	215,856	325,102	412,800	416,281	414,672	398,592
1940 (continued)	**July**	**August**	**September**	**October**	**November**	**December**
Production—U. S. Domestic Market †	165,672	45,172	220,696	.....	.....	.....
Retail Sales—U. S. ‡	298,683	177,679	157,418	.....	.....	.....
Change in Inventory	−133,011	−132,507	+63,278	.....	.....	.....
Inventory, First of Month	324,670	191,659	59,152	122,430	.....	.....

†—U. S. Census Bureau. ‡—Automobile Manufacturers Association.

A Verson TRADE MARK PRESS—

Built for the Deep Drawing and Stamping Problems of Today!

HERE'S a straight side mechanical press of 215 tons capacity that is ideal for the tough production schedules of industry's increasing pace. It is a typical example of the efficiency in design found in all Verson products.

Versatility, increased punch and die life, exceptionally clean stampings are inherent features of Verson Presses for they are built by the pioneers of welded allsteel frames.

Whether you manufacture generator rotor laminations or one-piece turret tops — there is a Verson Press to do your job efficiently, quickly and at minimum cost.

Let a Verson engineer help you choose the press you need.

SPECIFICATIONS:

Number of Press..7B36 • Stroke..10" Capacity..215 tons • Die Space..24" Slide area 24"x30" • Bed area 39"x36" Type of gearing, Double • Strokes per min., 20 • Type of clutch and brake, Verson Pneumatic • Type of clutch control, Electric Push Button.

Equipped with Verson Counterbalancing Cylinders and Verson Pneumatic Die cushions.

Verson Presses are available in capacities up to 5000 tons.

VERSON ALLSTEEL PRESS CO.

9307 South Kenwood Avenue • Chicago, Illinois

POWER PRESSES • HYDRAULIC PRESSES • CLUTCHES
FORGING PRESSES • PRESS BRAKES • DIE CUSHIONS

CENSORED

An exclusive feature prepared by the London correspondent of AUTOMOTIVE INDUSTRIES, *M. W. Bourdon.*

Barimar and Co., London, long connected with the automobile industry as welding specialists, claims to have developed a new process of welding ferrous and nonferrous metals, including steel and aluminum. Excellent results are said to be dependent upon a special flux, unusual methods of manipulation and extremely accurate flame control .

* * *

Inquiry of the Import Licensing Department of the Board of Trade shows little possibility of American or Canadian truck chassis being imported for commercial use as a result of the limitation recently imposed upon the production of British makes. There is said to be no intention at present to issue import licenses, except as a special concession in the case of vehicles urgently required by Government departments.

* * *

A plan submitted on behalf of Henry Ford for the free instruction of boys who wish to make farming a career has received the approval of the Ministry of Agriculture. The boys will receive their training at the Henry Ford Institute of Agricutural Engineering at Boreham, Essex, about 40 mi. from London and 25 mi. from the Ford plant at Dagenham. There will be 40 scholarships of £175 a year, 10 for three years known as the "Henry Ford" scholarships, 10 covering two years known as the "Edsel Ford" and 20 for one year known as the "Perry" scholarships, the latter named after Sir Percival Perry, chief of the English Ford organization.

* * *

The need for all available forging plants to be fully occupied in the production of shell casings and other types of munitions for which forgings are essential has led to certain truck manufacturers being instructed by the Ministry of Supply to substitute built-up rear axles of malleable castings in place of a one-piece forging, where this type of rear axle casing previously has been used. These instructions apply no less to military vehicles than to the few chassis now being made for civilian service.

* * *

An appeal to garage proprietors has been made by the War Department to release medium and heavyweight breakdown vehicles fitted with towing gear and derrick cranes.

Car Steel Purchases On "As Needed" Basis

Manufacturers of Automobiles Have Shaped Their 1941 Production Program to Federal Defense Requirements

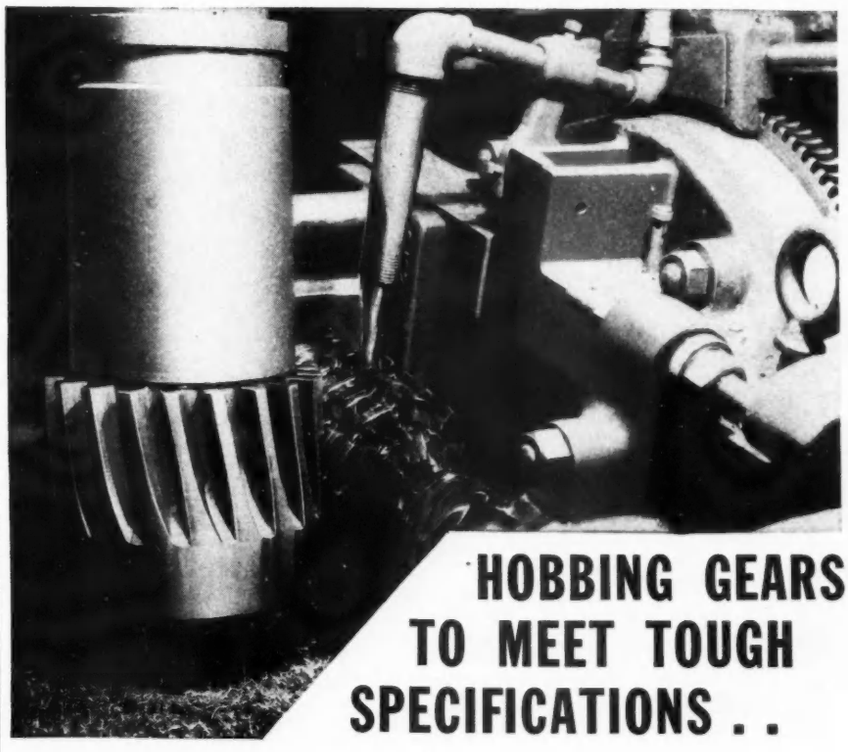
While automobile manufacturers have always taken steel as they needed it, they have at times, when attractive prices could be obtained, committed themselves for round tonnages, against which they later issued specifications and shipping instructions in conformity with their requirements for nearby assemblies. With prices stationary and the outlook for a continuance of market stability, buying as well as specifications and shipment are now on an "as needed" basis, it being nothing out of the ordinary for an automobile manufacturer to place a number of round tonnage orders in one and the same month, some accompanied by specifications, while others, although specifications are deferred, make it possible for the steel mill to provide the necessary semi-finished material in advance. In this, it is said, prevailing rumors of priority regulations being just around the corner have exerted no influence whatever.

It is pointed out that automobile manufacturers are well informed on the Government's defense needs and that their entire 1941 production program was shaped with this knowledge. Where the shoe pinches is that there has been in the last few weeks an ever-growing volume of so-called protective buying by other than automotive consumers and, relatively light as this may be, when compared with the steel industry's productive capacity, this type of buying has, nevertheless, affected the market's psychology. Some of the nonferrous metal interests have found it expedient to point out to protective-minded buyers that, in the event of a shortage hampering the progress of defense preparations, the authorities could always resort to commandeering, and idle warehouse stocks offered, therefore, little assurance of protection.

There has been so little in the way of quasi-speculative activity in recent years in the steel market that it is not thought drastic measures will be necessary to curb excesses, but steel producers subject incoming orders to close analysis, akin to a common sense method of priorities, but devoid of the red tape that goes with the official installation of such a system. The American Iron & Steel Institute estimates the rate of employed ingot capacity for the week ended Oct. 26 at 94.9 per cent, compared with 94.4 per cent in the preceding week. For all practical purposes, the industry's equipment and manpower may now be said to be fully engaged, week-to-week operating rates being subject to minor variations as the result of this or that blast furnace having to be reconditioned. More significant is the constant addition of plant facilities, one of the large independents having just announced plans for the addition of a new cold reduction mill and commensurate heat-treating furnaces.

Agreement between the Metals Reserve Co., acting for the Government, and some of the leading tin ore producers of Bolivia, which is to culminate in the establishment of a tin smelter in the United States and the production of 18,000 tons of tin a year here, has had no effect on the market. Spot Straits tin was quoted at the beginning of the week ended Oct. 26 at 51⅝ cents a pound.

Conditions in the copper market have eased off a bit. When the asked price in the outside market rose above 13 cents a pound, demand fell off, and there were no buyers even at 13 cents. The large mine producers maintain their price at 12 cents for spot electrolytic, with sales restricted to regular customers and their normal requirements.—W. C. H.



HOBBING GEARS TO MEET TOUGH SPECIFICATIONS . .

HOBBING gears of extreme hardness (325—350 Brinell) as used in oil well pumping reducers—for particularly arduous duty—was the problem of a Chicago manufacturer. In cutting and maintaining this unusual hardness and maintaining high accuracy, Cities Service oils were used as the cutting lubricant.

No doubt you have one or two like problems in your shop. Why not find out what our lubrication engineers can do for you in your own shop with the right metal cutting lubricant? Just write us to have a lubrication engineer call.

Copies of our booklet on "Metal Cutting Lubrication" are available to users of metal cutting lubricants. Write for your copy today, before the supply is exhausted.

CITIES SERVICE Cutting Oils "SERVICE PROVED"

CITIES SERVICE OIL COMPANY,
Sixty Wall Tower, Room 1626F, New York

Please send me information concerning your Lubrication Engineers' Service ☐

Please send me booklet on Metal Cutting Lubrication ☐

Name..... Title.....

Business Address.....

Firm Name.....

City..... State.....

New Four-Cylinder Engine In 1941 Ford Truck Line

A new four-cylinder engine is included in the Ford Motor Co.'s 1941 truck line. It develops 30 hp. at 2800 r.p.m. and 84 lb-ft. of torque at 1000 r.p.m. Cylinders are 3.187 by 3.75 in. with a total piston displacement of 119.5 cu. in.

The crankshaft is cast alloy steel and the camshaft cast alloy iron. Valves are chrome nickel steel with tungsten steel valve seat inserts for intake as well as exhaust valves. Precision-set valve lifters are used. The distributor is direct driven and the water pump is a pre-lubricated self-sealing type. The new engine has full pressure oiling. Commercial cars, three-quarter and one-ton trucks are available with either the new 30 hp. engine or the 85 hp. V-8 engine.

Perfect Circle To Expand Its Foundry

The Perfect Circle Co. has announced that it will build a $175,000 addition to its present foundry building at New Castle, Ind.

Control
HARRISON THERMOSTATS are designed to do one job—to hold engine temperatures within the range required for most efficient operation.
This they do most effectively, as a result of careful design, close control of materials, and precise manufacturing methods.
For accurate and dependable engine temperature control, specify—
HARRISON
THERMOSTATS
Harrison Radiator Division, General Motors Corporation, Lockport, New York

ADVERTISING

McCann-Erickson, Inc., has taken over all advertising on Ford motor cars and trucks, while Maxon, Inc., will handle the Mercury and Lincoln accounts. N. W. Ayer & Son, Inc., retains the radio work on the Ford Sunday Evening Hour.

Herbert M. Wertz has been named advertising manager of the Toledo Steel Products Co. He formerly was with the industrial division of the DeVilbiss Co. Ruthrauff & Ryan, Inc., is handling the account.

Frank Chance, account executive on the Fisher Body account for Arthur Kudner, Inc., New York, died Oct. 22 in New York after several months' illness.

Ourselves & Government

A Check List of Federal Action Corrected to Oct. 28

FEDERAL TRADE COMMISSION

GM EXCLUSIVE DEALER CASE. Final arguments made on Oct. 15. Case taken under advisement.

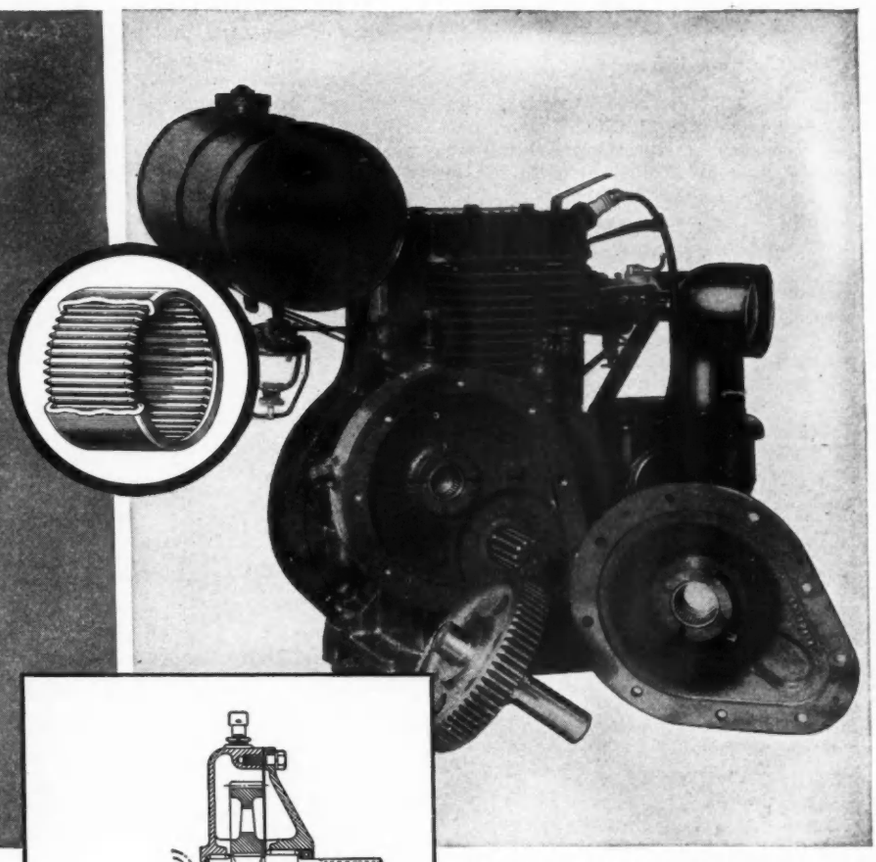
FORD SIX PER CENT CASE. Circuit Court of Appeals, Sixth Circuit (Cincinnati) on Oct. 18 denied motion for order requiring the commission to certify as a part of the record in the case the trial examiner's report and the exceptions to it.

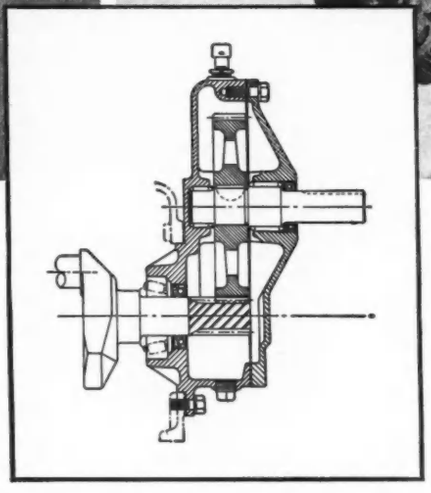
Zero-Fahrenheit Viscosity of Winter Lubricating Oils

About seven years ago, when trouble began to be experienced as a result of insufficient starter capacity to crank engines in cold weather, and when it was found that the use of lighter winter lubricants would solve the problem, the SAE Lubricants Division published tentative viscosity specifications for 10-W and 20-W lubricating oils, setting limits for the viscosity of each oil at zero Fahr. There was then, and there has been up to now, no official method of either determining or estimating the viscosity of an oil at this temperature, and instances have arisen where it was held that oils sold as either 10-W or 20-W did not come within the viscosity limits called for. There being no official method of determining the viscosity, the supplier had no effective means of presenting his side of the case. This situation has now been met by a statement prepared by the SAE Lubricants Division, Subdivision C, in collaboration

(*Turn to page* 520, *please*)

WISCONSIN PICKS TORRINGTON NEEDLE BEARING FOR SMALL SIZE & HIGH CAPACITY





(*Above*) Disassembled gear reduction housing on the Model AB WISCONSIN air-cooled industrial engine illustrates how two Needle Bearings contribute to long, trouble-free anti-friction performance.

(*Left*) Cross-section shows how readily the Torrington Needle Bearing adapts itself to compact design.

GETS COST REDUCTION AND SERVICE RECORD AS WELL

For the reduction gear assembly of its famous air-cooled Model AB gasoline engine, the Wisconsin Motor Company selected the Torrington Needle Bearing for *small size* and *high capacity*. And, in addition, they secured two other important advantages—*reduction in machining and assembly costs*, and a *service record of no bearing failure in 1,800 installations*.

"We adopted the Torrington Needle Bearing," says A. H. Wehmeyer, Assistant Chief Engineer, "because in our gear reduction unit, the center between the main take-off shaft and the engine crankshaft was so close that it meant the use of a bearing with minimum radial thickness and at the same time a high load capacity.

"And," adds Mr. Wehmeyer, "since the Needle Bearing has these qualities, and required a minimum diametrical bore for installation, we cut down the machining and assembly cost. As far as service is concerned, we have shipped out 1,800 reduction unit installations on the engine, and, to date, *have not received one complaint due to bearing failure*."

Performance like this is typical of the Torrington Needle Bearing—for it is engineered for long life under severe conditions. And its ready adaptability to product design is another characteristic. Because of its simple construction, small diameter and long axis, its ease of assembly and lubrication; it introduces no design complications. In fact, it frequently offers opportunities for simplification in the design of surrounding members, with consequent savings in space, weight and cost.

The Torrington Engineering Department will gladly work with you in adapting the advantages of the Needle Bearing to *your* product. For further information write for Catalog No. 7. For Needle Bearings to be used in heavier service, request Booklet 103X from our associate, the Bantam Bearings Corporation, South Bend, Ind.

The Torrington Company
ESTABLISHED 1866
Torrington, Conn., U.S.A.

Makers of Needle and Ball Bearings

New York Boston Philadelphia Detroit
Cleveland Chicago London, England

TORRINGTON
NEEDLE BEARING

Winter Oils

(*Continued from page* 518)

with the ASTM Committee D2, Subcommittee V, on a "Method for Estimating Viscosity at Zero F, and Comparison of Results with those obtained by the use of the old ASTM Viscosity-Temperature Chart." The statement reads as follows:

The viscosity at zero F, of engine crankcase oils and transmission and rear-axle lubricants shall be estimated by extrapolation on the ASTM Viscosity-Temperature Charts, ASTM Designation: D 341—39, from kinematic viscosities determined by the Tentative Method of Test for Kinematic Viscosity, ASTM Designation: D 445—39 T, at two temperatures that are at least 60 F apart (for example, 70 F and 130 F or 100 F and 210 F), or from Saybolt viscosities determined by the Standard Method of Test for Viscosity by means of the Saybolt Viscosimeter, ASTM Designation: D 88—38, at 70 F and 130 F in the case of low viscosity engine crankcase oils (below SAE 30) and at 100 F and 210 F in the case of high viscosity engine crankcase oils and transmission or rear-axle lubricants.

The error in estimating viscosities at zero F is cumulative and is far greater than the errors in individual viscosity determinations. Assuming absolute accuracy in extrapolating on the viscosity-temperature chart, an error of ±0.5% in the viscosity determinations at 100 F and 210 F may, in the case of an oil having a viscosity of 10,000 sec. at zero F, result in an error of 10 to 15% in the estimated viscosity at zero F. To this error, resulting solely from errors in viscosity determinations, must be added the actual error involved in the process of extrapolation, which should not exceed an additional 15%. With proper attention to details of procedure outlined in the ASTM methods, the estimated viscosity at zero F reported by experienced operators working in different laboratories with standardized equipment should not differ more than the amounts shown in the following table:

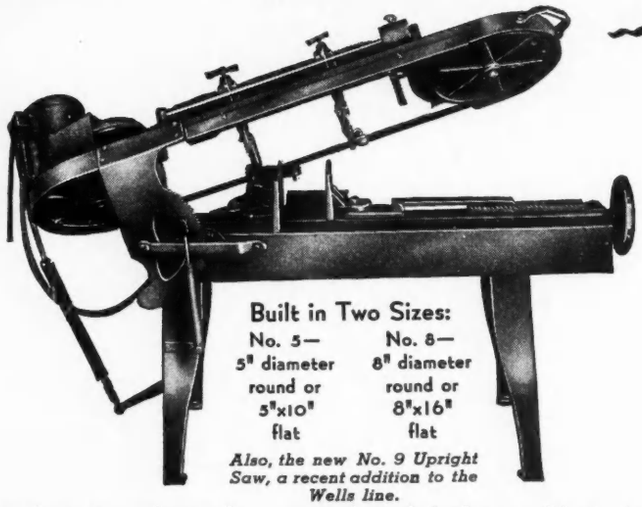
Estimated viscosity at zero F extrapolated from	Maximum error in estimated viscosity at zero F
Saybolt viscosities determined at 100 F and 210 F	±20%
Saybolt viscosities determined at 70 F and 130 F	±10%
Kinematic viscosities determined at 100 F and 210 F	±10%
Kinematic viscosities determined at 70 F and 130 F	± 5%

The estimated viscosity at zero F, determined in accord with the above procedure, may differ from values obtained by extrapolation on the original ASTM Viscosity-Temperature Chart (ASTM Designation: D 341—32 T). For example, an oil having an estimated viscosity of 10,000 Saybolt sec. at zero F when extrapolated on the original chart from viscosities determined at 100 F and 210 F, may have an estimated viscosity as high as 12,000 Saybolt sec. when the extrapolation is made in accord with the recommended procedure on the new charts (ASTM Designation: D 341—39). This increase from 10,000 to 12,000 sec. is due solely to the fundamental difference between the old and new viscosity-temperature charts and does not include differences in reported values due to errors in individual viscosity determinations and errors in extrapolating. If the viscosity at zero F is extrapolated from kinematic values determined at 100 F and 210 F or from Saybolt values determined at 70 F and and 130 F in accord with the recommended practice, the error in the estimated viscosity at zero F may be as high as ±10%. Therefore, an oil having an estimated viscosity of 10,000 Saybolt sec. on the old chart and 12,000 Saybolt sec. on the new chart may be reported as high as 13,200 Saybolt sec. If the viscosity at zero F is extrapolated from Saybolt values determined at 100 F and 210 F (this practice is not recommended on account of the difficulty of accurately determining Saybolt viscosity at 210 F), the error may be as high as ±20% and the oil having an estimated viscosity of 10,000 Saybolt sec. at zero F on the old chart may be reported as high as 14,400 Saybolt sec. without any actual change in the viscosity of the lubricant.

"OUR NEW WELLS SAW IS ONE OF THE HANDIEST TOOLS IN THE SHOP!"

Says WORLD'S LARGEST BUILDER OF MAGNETIC EQUIPMENT

Wells Mfg. Corp.
Three Rivers, Mich.
Gentlemen:
Our new Wells Saw is performing beautifully—we wonder now how we got along without it. It replaces an old machine that caused a bottleneck. Now we have no trouble as the Wells is fast and very accurate. It works 16 hours a day and blade trouble is rare indeed.
It is one of the handiest tools in the shop.
Very truly yours,
DINGS MAGNETIC SEPARATOR CO.
D. Stricklin, Supt.



Built in Two Sizes:

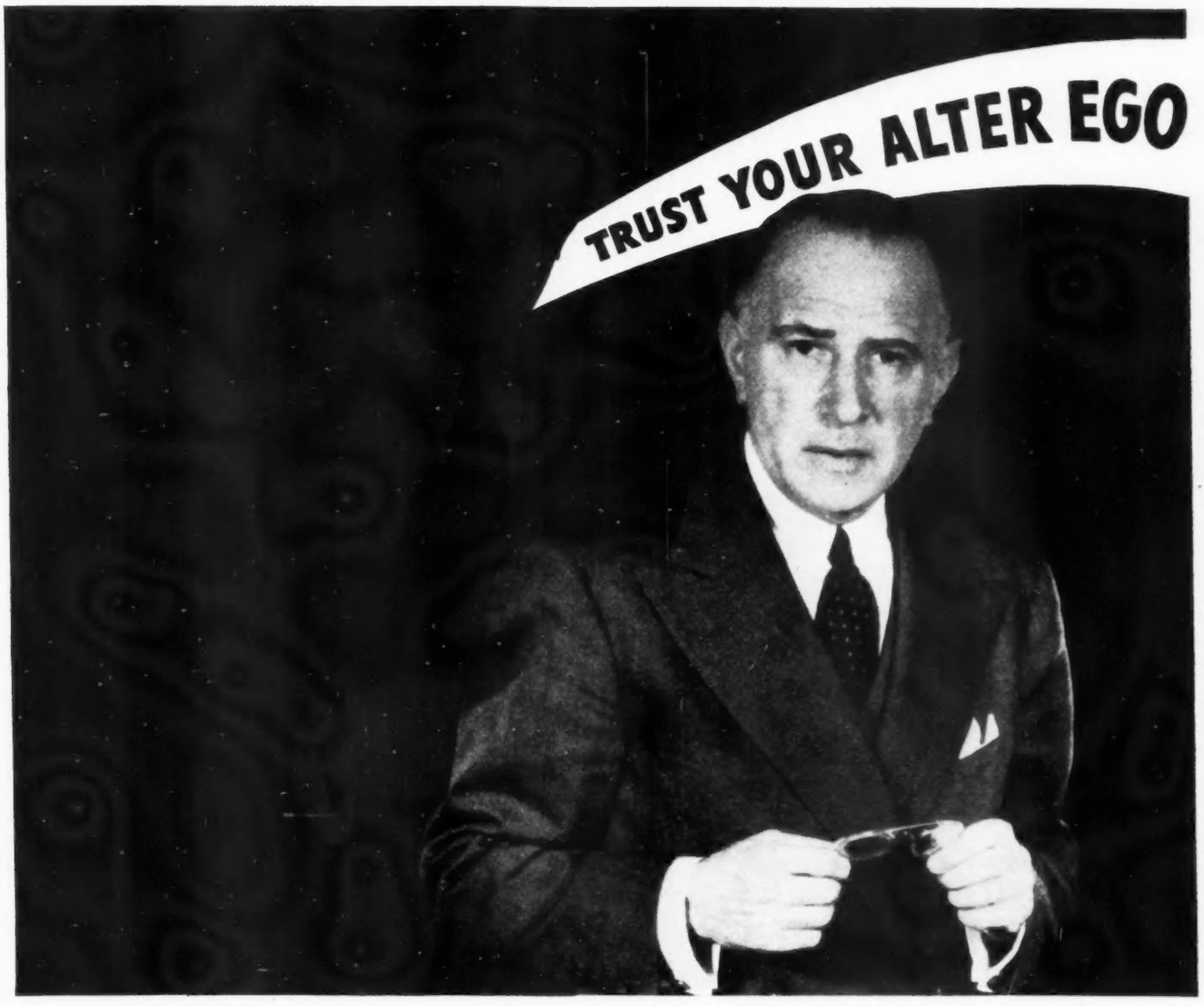
No. 5—	No. 8—
5" diameter round or 5"x10" flat	8" diameter round or 8"x16" flat

Also, the new No. 9 Upright Saw, a recent addition to the Wells line.

NOW'S the time to replace obsolete equipment with a speedy, accurate, dependable Wells Saw. Take a tip from the testimonial above—it's typical of results Wells Saw users everywhere are experiencing. Write for details now.

WELLS MANUFACTURING CORP.
THREE RIVERS • MICHIGAN

WELLS METAL CUTTING BAND SAWS



ALTER EGO: Literally "one's other self"—the still, small voice that questions, inspires and corrects our conscious action.

ALTER EGO: Let's talk things over. As your other self, I feel it my duty to give you some advice on how to improve your product and cut its cost.

Well, you're one fellow I don't mind getting advice from. I know you *won't try to sell me something.*

ALTER EGO: All right. Here's my suggestion. First, improve your reasoning technique. Learn to *trust your Alter Ego.* Listen to that inner voice more often.

All right, but I've had to use my conscious mind so much to ward off exposure to arc welding salesmen that I've got in the habit of trusting my surface judgment.

ALTER EGO: Yes, and because of surface reasoning you're too prone to deride that which you don't sufficiently understand. Look how others are profiting with arc welding.

But how can I understand arc welding without opening up to sales exposure?

ALTER EGO: I understand that Lincoln is a good source for arc welding information that's devoid of your pet aversion. Not a high-pressure sales talk in a book-full.

• •

LINCOLN SUGGESTS: To acquaint yourself with arc welding, why not obtain a factual, informative discussion of this metal working process—as applied to your problems? Lincoln has a series of bulletins on Design for Welding which suggests how to change over to arc welding for improved products, lower costs and faster production. Why not write for them?

LINCOLN "SHIELD-ARC" WELDING THE LINCOLN ELECTRIC COMPANY Cleveland, Ohio

Authoritative Information on Design • Production • Welding Equipment

PUBLICATIONS

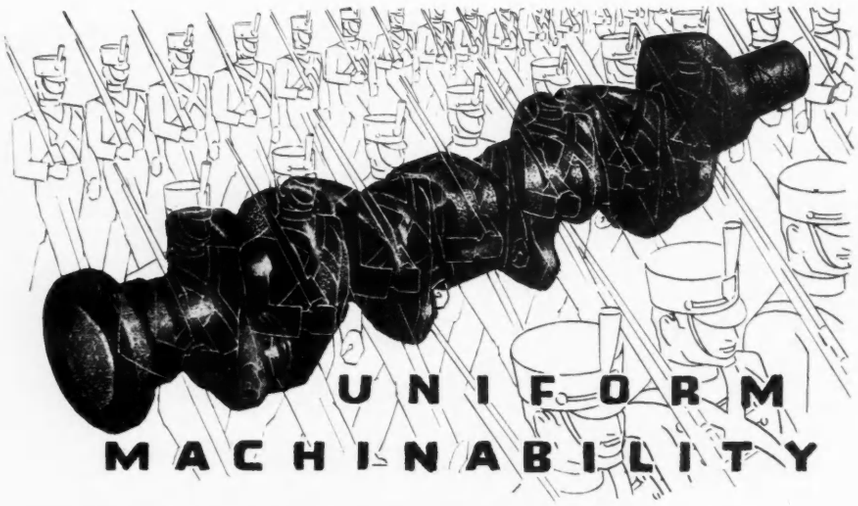
Data of especial interest to individuals who are concerned with problems related to the lubrication of high-speed machinery, tools and equipment is contained in a brochure covering the line of **"Sturaco" machinery oils and greases** produced by D. A. Stuart Oil Co., Ltd., Chicago.*

Differential Wheel Corp., Detroit, has issued a new folder devoted to its line of **differential dual wheels** for axle service of any type.*

Procedures for producing all types of welds in mild steel, for welding all metals used to any extent industrially and for applying surfacing metal to meet any type of wear-action in service are given in the **"Lincoln Weldirectory"**, a bulletin prepared by the Lincoln Electric Co., Cleveland, Ohio.*

Several new booklets, brought out by the **Aircraft & Diesel Equipment Corp.**, Chicago, are: "Hand Pump for Testing Injector and Other Hydraulic Devices"; "The Story of Adeco"; "How Adeco Serves Aircraft Manufacturers".*

* Obtainable through editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia. Please give date of issue in which literature was listed.



THE ORIGINAL QUOTED PRICE of a Drop Forging is an elusive measure of value. Estimates that sound cheap at the beginning too often prove dear in final machining.

Atlas Drop Forgings are built first to give satisfaction in actual use. And, strange as it may seem, that is the secret of their economy.

Closely held limits of excess metal, narrow weight tolerances, uniform hardness and texture . . . these are Atlas qualities that gladden the hearts of shop superintendents by cutting deeply into time charges and tool expense.

A Forging is More than just a Shape and a Symbol Number at Atlas

A Good FORGING must BE MORE THAN A SHAPE

UPHOLDING QUALITY 1906 ATLAS

ATLAS DROP FORGINGS
All shapes and sizes to 500 lbs.
ANY ALLOY STEEL - LABORATORY CONTROLLED
ATLAS DROP FORGE CO., LANSING, MICH.

Corrosion Characteristics of Wrought Aluminum Alloys

Duralumin alloys are susceptible to two types of corrosion. Corrosive attack may follow the crystal boundaries of the metal and thus seriously reduce its strength and resistance to shock. On the other hand, material of the same composition that has been given a different heat treatment may be susceptible only to the pitting type of attack, which is generally less damaging to the strength of the alloy than the intercrystalline type. The customary method of determining the type of attack that may develop in duralumin is to immerse the material for several hours in a solution that accelerates corrosion.

Because the electrochemical potential of duralumin in a salt solution is different for similar samples that have been given different heat treatments, the measurement of these potentials has been suggested as a means of predicting the type of corrosion that may occur. To determine the reliability of such predictions, Hugh L. Logan of the National Bureau of Standards, has measured the potentials of many samples of material, some known to be susceptible only to pitting, and others known to be susceptible to intercrystalline corrosion. In the *Journal of Research* for September (RP1328), it is shown that samples having potentials more negative than —0.657 volt, against a saturated calomel electrode, were generally susceptible to intercrystalline corrosion. Conversely, materials having

Correction

Steering and brake specifications for 1941 passenger cars tabulated in the Oct. 15 issue of AUTOMOTIVE INDUSTRIES (p. 450) contained an error in listing the make of steering gear for Chevrolet, Oldsmobile and Pontiac cars, to which attention is called. Steering gear for the three makes is supplied by the Saginaw Steering Gear Division of General Motors, according to later information available.

MEN AND MACHINES

(*Continued from page* 507)

Grinding machines built by the Blanchard Machine Co., Cambridge, Mass., are described in a new brochure prepared by the manufacturer.*

Bulletin No. 12-E describing its "chatterless" **countersinks** has been issued by the Severance Tool Mfg. Co., Saginaw, Mich.*

Pyott Foundry & Machine Co., Chicago, has issued a 112-page handbook on V-belt drive selection, making use of the revised V-belt ratings. Known as V-500, the publication contains considerable useful information in addition to descriptions and photographs covering the Pyott line of **drive equipment.***

*Obtainable through editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia. Please give date of issue in which literature was listed.